WORK ORDER NO.1382693

APPROPRIATION: NAF

Renovation of NGIS Building 678

At

Coddington Point
Newport Naval Station, RI

FY16 NGIS Project
NAVFAC Mid-Atlantic, North IPT

SUBMITTED BY:

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(A/E Contract N40085-14-D-5227 TO 0017)

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PROJECT TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 15 LIST OF DRAWINGS
00 22 13.00 20 SUPPLEMENTARY INSTRUCTIONS TO OFFERORS

DIVISION 01 - GENERAL REQUIREMENTS

01 11 00 SUMMARY OF WORK
01 14 00 WORK RESTRICTIONS
01 20 00.00 20 PRICE AND PAYMENT PROCEDURES
01 30 00 ADMINISTRATIVE REQUIREMENTS
01 32 17.00 20 COST-LOADED NETWORK ANALYSIS SCHEDULES (NAS)
01 33 00 SUBMITTAL PROCEDURES
01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS
01 42 00 SOURCES FOR REFERENCE PUBLICATIONS
01 45 00.00 20 QUALITY CONTROL
01 45 35 SPECIAL INSPECTIONS
01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS
01 58 00 PROJECT IDENTIFICATION
01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
01 78 00 CLOSEOUT SUBMITTALS
01 78 23 OPERATION AND MAINTENANCE DATA
01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI)
01 91 00.00 40 COMMISSIONING

DIVISION 02 - EXISTING CONDITIONS

02 41 00 DEMOLITION
02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS
02 82 16.00 20 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS
02 83 13.00 20 LEAD IN CONSTRUCTION
02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
02 85 00.00 20 MOLD REMEDIATION

DIVISION 03 - CONCRETE

03 30 00 CAST-IN-PLACE CONCRETE

DIVISION 05 - METALS

05 12 00 STRUCTURAL STEEL
05 40 00 COLD-FORMED METAL FRAMING
05 50 13 MISCELLANEOUS METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00 ROUGH CARPENTRY
06 41 16.00 10 LAMINATE CLAD ARCHITECTURAL CASEWORK
06 61 16 SOLID POLYMER (SOLID SURFACING) FABRICATIONS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 21 16 MINERAL FIBER BLANKET INSULATION
07 42 63 FABRICATED WALL PANEL ASSEMBLIES

07 60 00 FLASHING AND SHEET METAL
07 84 00 FIRESTOPPING
07 92 00 JOINT SEALANTS

DIVISION 08 - OPENINGS

08 11 13 STEEL DOORS AND FRAMES
08 14 00 WOOD DOORS
08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES (AND WINDOW UNITS)
08 71 00 DOOR HARDWARE
08 81 00 GLAZING
08 91 00 METAL WALL LOUVERS

DIVISION 09 - FINISHES

09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD
09 29 00 GYPSUM BOARD
09 30 13 CERAMIC TILING
09 51 00 ACOUSTICAL CEILINGS
09 65 00 RESILIENT FLOORING
09 90 00 PAINTS AND COATINGS

DIVISION 10 - SPECIALTIES

10 14 00.20 INTERIOR SIGNAGE
10 26 00 WALL AND DOOR PROTECTION

DIVISION 12 - FURNISHINGS

12 48 13 ENTRANCE FLOOR MATS AND FRAMES

DIVISION 21 - FIRE SUPPRESSION

21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

DIVISION 22 - PLUMBING

22 00 00 PLUMBING, GENERAL PURPOSE

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS
23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS
23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS
23 09 23.13 20 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC
23 64 26 HEATING-HOT WATER PIPING SYSTEMS
23 81 00.00 20 UNITARY AIR CONDITIONING EQUIPMENT
23 82 00.00 20 TERMINAL HEATING AND COOLING UNITS

DIVISION 26 - ELECTRICAL

26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS
26 20 00 INTERIOR DISTRIBUTION SYSTEM
26 29 23 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS
26 41 00 LIGHTNING PROTECTION SYSTEM
26 51 00.00 22 INTERIOR LIGHTING

DIVISION 27 - COMMUNICATIONS

27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 23 23.00 10 CLOSED CIRCUIT TELEVISION SYSTEMS
28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM

DIVISION 31 - EARTHWORK

31 11 00 CLEARING AND GRUBBING

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 16 13 CONCRETE SIDEWALKS AND CURBS AND GUTTERS
32 17 24.00 10 PAVEMENT MARKINGS
32 93 00 EXTERIOR PLANTS

APPENDIX A - HAZARDOUS MATERIALS REPORT

-- End of Project Table of Contents --

DOCUMENT 00 01 15

LIST OF DRAWINGS
02/11

PART 1 GENERAL

1.1 SUMMARY

This section lists the drawings for the project pursuant to contract clause "DFARS 252.236-7001, Contract Drawings, Maps and Specifications."

1.2 CONTRACT DRAWINGS

Contract drawings are as follows:

INDEX OF DRAWINGS			
SHEET OF	NAVFAC NO.	SHEET NO.	SHEET NAME
GENERAL			
1	12721987	G-001	COVER SHEET
2	12721988	G-002	INDEX OF DRAWINGS
3	12721989	GI001	LIFE SAFETY NARRATIVE AND BUILDING CODE ANALYSIS
4	12721990	GI110	BASEMENT & FIRST FLOOR LIFE SAFETY PLANS
5	12721991	GI111	SECOND & THIRD FLOOR LIFE SAFETY PLANS
6	12721992	GI112	FOURTH AND FIFTH FLOOR LIFE SAFETY PLANS
CIVIL			
7	12721993	C-100	EXISTING CONDITIONS SITE PLAN
8	12721994	C-201	SITE PLAN
9	12721995	C-501	DETAILS
STRUCTURAL			

10	12721996	S-001	GENERAL NOTES
11	12721997	S-501	WINDOW FRAME SUPPORT DETAILS
12	12721998	S-502	WINDOW FRAME SUPPORT DETAILS
ARCHITECTURAL			
13	12721999	A-001	ARCHITECTURAL LEGEND & ABBREVIATIONS
14	12722000	AD101	FIRST AND SECOND FLOOR PLANS - DEMOLITION
15	12722001	AD102	THIRD AND FOURTH FLOOR PLANS - DEMOLITION
16	12722002	AD103	FIFTH FLOOR AND ROOF PLANS - DEMOLITION
17	12722003	AD201	EXTERIOR ELEVATIONS - DEMOLITION
18	12722004	AD202	EXTERIOR ELEVATIONS - DEMOLITION
19	12722005	AD401	ENLARGED PLANS - DEMOLITION
20	12722006	AD402	ENLARGED PLANS - DEMOLITION
21	12722007	A-101	FIRST AND SECOND FLOOR PLANS
22	12722008	A-102	THIRD AND FOURTH FLOOR PLANS
23	12722009	A-103	FIFTH FLOOR AND ROOF PLAN
24	12722010	A-201	EXTERIOR BUILDING ELEVATIONS
25	12722011	A-202	EXTERIOR BUILDING ELEVATIONS
26	12722012	A-301	WALL SECTIONS
27	12722013	A-401	ENLARGED PLANS
28	12722014	A-402	ENLARGED PLANS
29	12722015	A-411	ENLARGED REFLECTED CEILING PLANS
30	12722016	A-421	INTERIOR ELEVATIONS

31	12722017	A-422	INTERIOR ELEVATIONS
32	12722018	A-501	PARTITION TYPES
33	12722019	A-511	PENETRATION DETAILS
34	12722020	A-531	MILLWORK DETAILS AND SECTIONS
35	12722021	A-532	MILLWORK DETAILS AND SECTIONS
36	12722022	A-541	INTERIOR DETAILS
37	12722023	A-551	WALL DETAILS
38	12722024	A-561	DOOR AND STOREFRONT DETAILS
39	12722025	A-562	WINDOW DETAILS
40	12722026	A-571	CEILING DETAILS
41	12722027	A-601	ROOM FINISH SCHEDULE
42	12722028	A-602	DOOR AND WINDOW SCHEDULE
43	12722029	A-701	SIGNAGE FIRST AND SECOND FLOOR PLAN
44	12722030	A-702	SIGNAGE THIRD AND FOURTH FLOOR PLAN
45	12722031	A-703	SIGNAGE FIFTH FLOOR PLAN
46	12722032	A-711	SIGNAGE SCHEDULE
47	12722033	A-712	SIGNAGE DETAILS
48	12722034	A-713	SIGNAGE DETAILS
INTERIORS			
49	12722035	I-101	INTERIOR FINISH ELEVATIONS
50	12722036	I-102	INTERIOR FINISH FIRST, SECOND, THIRD AND FOURTH PLAN
51	12722037	I-103	INTERIOR FINISH FIFTH FLOOR
52	12722038	I-104	ENLARGED INTERIOR FINISH FLOOR PLANS
53	12722039	I-110	INTERIOR LEGEND & ABBREVIATIONS, GENERAL NOTES AND FF&E SCHEDULES

54	12722040	I-111	FURNITURE FIRST, SECOND, THIRD AND FOURTH FLOOR PLANS
55	12722041	I-112	FURNITURE FIFTH FLOOR
56	12722042	I-113	ENLARGED FURNITURE PLANS
57	12722043	I-121	FURNITURE ELEVATIONS
58	12722044	I-122	FURNITURE ELEVATIONS
59	12722045	I-125	WINDOW TREATMENT DETAILS
FIRE PROTECTION			
60	12722046	FA001	FIRE ALARM SYMBOLS, LEGEND AND ABBREVIATIONS
61	12722047	FA100D	FIRE ALARM DEMOLITION PLAN - BASEMENT
62	12722048	FA110D	FIRE ALARM DEMOLITION PLAN - LEVEL 1
63	12722049	FA120D	FIRE ALARM DEMOLITION PLAN - LEVEL 2
64	12722050	FA130D	FIRE ALARM DEMOLITION PLAN - LEVEL 3
65	12722051	FA140D	FIRE ALARM DEMOLITION PLAN - LEVEL 4
66	12722052	FA150D	FIRE ALARM DEMOLITION PLAN - LEVEL 5
67	12722053	FA100	FIRE ALARM PLAN - BASEMENT
68	12722054	FA110	FIRE ALARM PLAN - LEVEL 1
69	12722055	FA120	FIRE ALARM PLAN - LEVEL 2
70	12722056	FA130	FIRE ALARM PLAN - LEVEL 3
71	12722057	FA140	FIRE ALARM PLAN - LEVEL 4
72	12722058	FA150	FIRE ALARM PLAN - LEVEL 5
73	12722059	FA501	FIRE ALARM DETAILS

74	12722060	FA601	FIRE ALARM RISER
75	12722061	FA602	FIRE ALARM MATRIX
76	12722062	FX001	FIRE SUPPRESSION NOTES, LEGEND AND ABBREVIATIONS
77	12722063	FX110	FIRE SUPPRESSION PLAN - LEVEL 1
78	12722064	FX120	FIRE SUPPRESSION PLAN - LEVEL 2
79	12722065	FX130	FIRE SUPPRESSION PLAN - LEVEL 3
80	12722066	FX140	FIRE SUPPRESSION PLAN - LEVEL 4
81	12722067	FX150	FIRE SUPPRESSION PLAN - LEVEL 5
82	12722068	FX601	FIRE SUPPRESSION ONE LINE DIAGRAM
PLUMBING			
83	12722069	P-001	PLUMBING GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS
84	12722070	PD100	BASEMENT - PLUMBING DEMO PLAN
85	12722071	PD101	FIRST, SECOND, THIRD AND FOURTH FLOOR - PLUMBING DEMO PLAN
86	12722072	PD102	FIFTH FLOOR AND ROOF - PLUMBING DEMO PLAN
87	12722073	PD401	ENLARGED WASTE & VENT DEMOLITION PLANS
88	12722074	PD402	ENLARGED PLUMBING DEMOLITION PLANS
89	12722075	PL101	BASEMENT AND FIRST FLOOR DOMESTIC WATER PIPING PLANS

90	12722076	PL102	SECOND, THIRD, FOURTH AND FIFTH FLOOR DOMESTIC WATER PLANS
91	12722077	PW101	BASEMENT AND FIRST FLOOR SANITARY / VENT PIPING PLANS
92	12722078	PW102	SECOND, THIRD, FOURTH AND FIFTH FLOOR SANITARY / VENT PIPING PLAN
93	12722079	P-401	ENLARGED DOMESTIC WATER PIPING PLANS
94	12722080	P-402	ENLARGED SANITARY / VENT PIPING PLANS
95	12722081	P-501	PLUMBING DETAILS
96	12722082	P-601	PLUMBING SCHEDULES
97	12722083	P-701	PLUMBING SUPPLY RISER DIAGRAMS
98	12722084	P-702	PLUMBING SUPPLY RISER DIAGRAMS
99	12722085	P-703	PLUMBING SANITARY / VENT RISER DIAGRAMS
100	12722086	P-801	DOMESTIC WATER HEATER SCHEMATIC
MECHANICAL			
101	12722087	M-001	MECHANICAL LEGEND AND ABBREVIATIONS
102	12722088	MD100	BASEMENT - HVAC DEMO PLAN
103	12722089	MD101	FIRST, SECOND, THIRD AND FOURTH FLOOR - HVAC DEMO PLAN
104	12722090	MD102	FIFTH FLOOR AND ROOF - HVAC DEMO PLAN
105	12722091	MD801	HEATING HOT WATER RISER DIAGRAMS - DEMO
106	12722092	M-100	BASEMENT HVAC / PIPING PLAN

107	12722093	MH101	FIRST, SECOND, THIRD AND FOURTH FLOOR HVAC PLANS
108	12722094	MH102	FIFTH FLOOR AND ROOF HVAC PLANS
109	12722095	MP101	FIRST,SECOND ,THIRD AND FOURTH FLOOR PIPING PLANS - NEW WORK
110	12722096	MP102	FIFTH FLOOR PIPING AND ROOF PLANS
111	12722097	M-401	ENLARGED MECH ROOM HVAC PLAN
112	12722098	M-501	MECHANICAL DETAILS
113	12722099	M-502	MECHANICAL DETAILS
114	12722100	M-601	MECHANICAL SCHEDULES
115	12722101	M-602	MECHANICAL SCHEDULES
116	12722102	MI700	CONTROLS LEGEND AND ABBREVIATIONS
117	12722103	MI701	HVAC CONTROLS AND SOO - DOAS-1
118	12722104	MI702	HVAC CONTROLS AND SOO - MISC
119	12722105	MI703	HVAC CONTROLS AND SOO - HEATING PLANT
120	12722106	M-801	HEATING HOT WATER RISER DIAGRAMS
121	12722107	M-802	HVAC DUCTWORK RISERS DIAGRAM
122	12722108	M-803	HEATING HOT WATER SCHEMATIC
ELECTRICAL			
123	12722109	E-001	ELECTRICAL SYMBOLS, ABBREVIATIONS AND LEGEND
124	12722110	E-002	ELECTRICAL DEMOLITION AND PHASING REQUIREMENTS
125	12722111	ED100	ELECTRICAL DEMOLITION PLAN - BASEMENT
126	12722112	ED101	ELECTRICAL DEMOLITION PLAN - 1ST FLOOR

127	12722113	ED102	ELECTRICAL DEMOLITION PLAN - 2ND FLOOR
128	12722114	ED103	ELECTRICAL DEMOLITION PLAN - 3RD FLOOR
129	12722115	ED104	ELECTRICAL DEMOLITION PLAN - 4TH FLOOR
130	12722116	ED105	ELECTRICAL DEMOLITION PLAN - 5TH FLOOR
131	12722117	ED401	DEMOLITION ENLARGED PLANS
132	12722118	ED402	DEMOLITION ENLARGED PLANS
133	12722119	EP100	ELECTRICAL POWER PLAN - BASEMENT
134	12722120	EP101	ELECTRICAL POWER PLAN - 1ST FLOOR
135	12722121	EP102	ELECTRICAL POWER PLAN - 2ND FLOOR
136	12722122	EP103	ELECTRICAL POWER PLAN - 3RD FLOOR
137	12722123	EP104	ELECTRICAL POWER PLAN - 4TH FLOOR
138	12722124	EP105	ELECTRICAL POWER PLAN - 5TH FLOOR
139	12722125	EP106	ELECTRICAL POWER PLAN - ROOF
140	12722126	EL101	ELECTRICAL LIGHTING PLAN - 1ST FLOOR
141	12722127	EL102	ELECTRICAL LIGHTING PLAN - 2ND FLOOR
142	12722128	EL103	ELECTRICAL LIGHTING PLAN - 3RD FLOOR
143	12722129	EL104	ELECTRICAL LIGHTING PLAN - 4TH FLOOR

144	12722130	EL105	ELECTRICAL LIGHTING PLAN - 5TH FLOOR
145	12722131	E-401	ENLARGED PLANS
146	12722132	E-402	ENLARGED PLANS
147	12722133	E-403	ENLARGED PLANS
148	12722134	E-501	DETAILS
149	12722135	E-502	DETAILS
150	12722136	E-601	RISER DIAGRAM
151	12722137	E-701	LIGHT FIXTURE SCHEDULE
152	12722138	E-702	LIGHTING PLATES
153	12722139	E-703	LIGHTING PLATES
154	12722140	E-704	PANELBOARD SCHEDULES
155	12722141	E-705	PANELBOARD SCHEDULES
156	12722142	E-706	PANELBOARD SCHEDULES
157	12722143	E-707	PANELBOARD SCHEDULES
158	12722144	E-708	PANELBOARD SCHEDULES
159	12722145	E-709	PANELBOARD SCHEDULES
TELECOMMUNICA			
160	12722146	T-001	TELECOMMUNICATIONS SYMBOLS, ABBREVIATIONS AND LEGEND
161	12722147	TD100	TELECOMMUNICATION DEMOLITION PLAN - BASEMENT
162	12722148	TD101	TELECOMMUNICATION DEMOLITION PLAN - 1ST FLOOR
163	12722149	TD102	TELECOMMUNICATION DEMOLITION PLAN - 2ND FLOOR
164	12722150	TD103	TELECOMMUNICATION DEMOLITION PLAN - 3RD FLOOR

165	12722151	TD104	TELECOMMUNICATION DEMOLITION PLAN - 4TH FLOOR
166	12722152	TD105	TELECOMMUNICATION DEMOLITION PLAN - 5TH FLOOR
167	12722153	TN100	TELECOMMUNICATIONS NEW WORK PLAN - BASEMENT
168	12722154	TN101	TELECOMMUNICATIONS NEW WORK PLAN - 1ST FLOOR
169	12722155	TN102	TELECOMMUNICATIONS NEW WORK PLAN - 2ND FLOOR
170	12722156	TN103	TELECOMMUNICATIONS NEW WORK PLAN - 3RD FLOOR
171	12722157	TN104	TELECOMMUNICATIONS NEW WORK PLAN - 4TH FLOOR
172	12722158	TN105	TELECOMMUNICATIONS NEW WORK PLAN - 5TH FLOOR
173	12722159	TN401	ENLARGED PLAN
174	12722160	TN402	ENLARGED PLANS
175	12722161	TN501	TELECOMMUNICATIONS DIAGRAMS
176	12722162	TN502	TELECOMMUNICATION DETAILS
177	12722163	TN503	TELECOMMUNICATION DETAILS

-- End of Document --

DOCUMENT 00 22 13.00 20

SUPPLEMENTARY INSTRUCTIONS TO OFFERORS
02/14

PART 1 GENERAL

1.1 CONTRACT LINE ITEMS

The terms Offeror and Bidder and versions thereof (offer/bid) have the same definition as used within this contract.

Provide the Contract Line Item (CLIN) lump sum price for the following items:

CLIN 0001 - BASE PRICE. Price includes the following:

Price for all work associated with the project, complete in accordance with the drawings and specifications, excluding the work related to the Option Items that follow.

CLIN 0002 Option No. 1

Price for providing all work in connection with replacement of damaged sidewalk and concrete panels, complete in accordance with the drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0002
0002	Replace the damaged exterior sidewalk and patio concrete panels, rather than repair them.	$_____

CLIN 0003 Option No. 2

Price for providing all work in connection with removing the tree and replacing with sod, planting new trees, adding lighting and a new sidewalk to the existing gazebo to the west of the building, complete in accordance with drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0003
0003	Removing the large tree at the North end of the building, adjacent to the exterior patio, and replace with sod. Plant new trees, add lighting and sidewalk to the existing gazebo to the west of the building.	$_____

CLIN 0004 Option No. 3

Price for providing all work in connection with adding lightning protection system to the building, complete in accordance with drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0004
0004	Adding a Lightning Protection System to the Building	$_____

CLIN 0005 Option No. 4

Price for providing all work in connection with replacing the existing guardrails and railings in the existing stairwells, complete in accordance with drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0005
0005	Replacing the existing stairwell guardrails and railings	$_____

CLIN 0006 Option No. 5

Price for providing all work in connection with providing solid surface shower surrounds instead of fiberglass surrounds, complete in accordance with drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0006
0006	Providing solid surface shower surrounds instead of fiberglass units	$_____

CLIN 0007 Option No. 6

Price for providing all work in connection with replace doors and hardware that are currently scheduled to be reused and laminated, complete in accordance with drawings and specifications.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0007
0007	Replacing doors and hardware that are currently scheduled to be reused and laminated	$_____

1.2 GENERAL BID NOTES

a. The Government reserves the unilateral right to award CLINs 0002, 0003, 0004, 0005, 0006 and 0007 to the Contractor at the proposed price within 30 calendar days after the contract award. A firm fixed proposed price is required for all CLINs. No provision is made for economic price

adjustment. If Options are exercised, the contract completion date remains the same.

b. Evaluation of Options (JUL 1990). Except when it is determined in accordance with FAR 17.206 (b) not to be in the Government's best interest, the Government will evaluate offers for award purposes by adding the price for the Option(s) to the total price for CLIN 0001. In accordance with FAR 52.217-5, evaluation of options will not obligate the Government to exercise the Option(s).

c. The Government may reject an offer as nonresponsive if it is materially unbalanced as to prices for the basic requirement and the option quantities. An offer is unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

d. If CLINs 0002 through 0007 are exercised, additional bonding and consent of surety is required. Consequently, the Performance Bond must reflect 100 percent of the aggregate amount of all Items.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Document --

SECTION 01 11 00

SUMMARY OF WORK
08/15

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1.2.1 Project Description

The work includes renovation of the Navy Gateway Inn and Suites (NGIS) Building 678 on Coddington Point at the Naval Station Newport and incidental related work.

1.2.2 Location

The work is located on Coddington Point at the Naval Station Newport, RI, approximately as indicated. The exact location will be shown by the Contracting Officer.

1.3 EXISTING WORK

In addition to "FAR 52.236-9, Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements":

a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work must be in a condition equal to or better than that which existed before new work started.

1.4 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation, and comply with Installation requirements for locating and marking underground utilities. Contact local utility locating service a minimum of 48 hours prior to excavating, to mark utilities, and within sufficient time required if work occurs on a Monday or after a Holiday. Verify existing utility locations indicated on contract drawings, within area of work.

Identify and mark all other utilities not managed and located by the local utility companies. Scan the construction site with Ground Penetrating Radar (GPR), electromagnetic, or sonic equipment, and mark the surface of the ground or paved surface where existing underground utilities are discovered. Verify the elevations of existing piping, utilities,and any

type of underground or encased obstruction not indicated, or specified to be removed, that is indicated or discovered during scanning, in locations to be traversed by piping, ducts, and other work to be conducted or installed.

1.4.1 Notification Prior to Excavation

Notify the Contracting Officer at least 5 days prior to starting excavation work.

1.5 GOVERNMENT-FURNISHED MATERIAL AND EQUIPMENT

1.5.1 Delivery Schedule

Notify the Contracting Officer in writing at least 10 calendar days in advance of the date on which the materials and equipment are required. Pick up materials and equipment no later than 30 calendar days after such date. When materials and equipment are not picked up by the 30th day, the Contractor will be charged for storage.

1.5.2 Delivery Location

The materials and equipment will be delivered to the jobsite.

1.6 GOVERNMENT-INSTALLED WORK

The Government will be installing the FFE once the Contractor is complete with work.

1.7 NAVY AND MARINE CORPS (NMCI) COORDINATION REQUIREMENTS

1.7.1 NMCI Contractor Access

Allow the NMCI Contractor access to the facility towards the end of construction (finishes 90 percent complete, rough-in 100 percent complete, Inside Plant (ISP)/Outside Plant (OSP) infrastructure in place) to provide equipment in the telecommunications rooms and make final connections. Coordinate efforts with the NMCI Contractor to facilitate joint use of building spaces during the final phases of construction. After the Contracting Officer has facilitated coordination meetings between the two contractors, within one week, incorporate the effort of additional coordination with the NMCI Contractor into the construction schedule to demonstrate a plan for maintaining the contract duration.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
11/11

PART 1 GENERAL

1.1 CONTRACTOR ACCESS AND USE OF PREMISES

1.1.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. Wear hard hats in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Mark Contractor equipment for identification.

1.1.1.1 Subcontractors and Personnel Contacts

Provide a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.1.1.2 Identification Badges and Installation Access

Application for and use of badges will be as directed. Obtain access to the installation by participating in the Navy Commercial Access Control System (NCACS), or by obtaining passes each day from the Base Pass and Identification Office. Costs for obtaining passes through the NCACS are the responsibility of the Contractor. One-day passes, issued through the Base Pass and Identification Office, will be furnished without charge. Furnish a completed EMPLOYMENT ELIGIBILITY VERIFICATION (DHS FORM I-9) form for all personnel requesting badges. This form is available at http://www.uscis.gov/portal/site/uscis by searching or selecting Employment Verification (Form I-9). Immediately report instances of lost or stolen badges to the Contracting Officer.

a. NCACS Program: NCACS is a voluntary program in which Contractor personnel who enroll, and are approved, are subsequently granted access to the installation for a period up to one year, or the length of the contract, whichever is less, and are not required to obtain a new pass from the Base Pass and Identification Office for each visit. The Government performs background screening and credentialing. Throughout the year the Contractor employee must continue to meet background screening standards. Periodic background screenings are conducted to verify continued NCACS participation and installation access privileges. Under the NCACS program, no commercial vehicle inspection is required, other than for Random Anti-Terrorism Measures (RAM) or in the case of an elevation of Force Protection Conditions (FPCON). Information on costs and requirements to participate and enroll in NCACS is available at http://www.rapidgate.com or by calling 1-877-727-4342. Contractors should be aware that the costs incurred to obtain NCACS credentials, or costs related to any means of access to a Navy Installation, are not reimbursable. Any time invested, or price(s) paid, for obtaining NCACS credentials will not be compensated in any way or approved as a direct cost of any contract with the

Department of the Navy.

1.1.1.3 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installation, except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.1.2 Working Hours

Regular working hours must consist of an 8 1/2 hour hour period established by the Contractor Officer, between Monday through Friday, excluding Government holidays.

1.1.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in a manner approved by the Contracting Officer.

1.1.4 Occupied and Existing Buildings

The Contractor shall be working in an existing building.

The existing buildings and their contents must be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

Provide dust covers or protective enclosures to protect existing work that remains and Government material during the construction period.

Relocate movable furniture approximately 10 feet away from the Contractor's working area, protect the furniture, and replace the furniture in its original location upon completion of the work. Leave attached equipment in place, and protect it against damage, or temporarily disconnect, relocate, protect, and reinstall it at the completion of the work.

The Government will remove and relocate other Government property in the areas of the buildings scheduled to receive work.

1.1.5 Utility Cutovers and Interruptions

a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in the paragraph "Work Outside Regular Hours."

b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.

c. Interruption to water, sanitary sewer, storm sewer, telephone service,

electric service, air conditioning, heating, fire alarm, compressed air, steam and natural gas are considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours."

d. Operation of Station Utilities: The Contractor must not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor must notify the Contracting Officer giving reasonable advance notice when such operation is required.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 20 00.00 20

PRICE AND PAYMENT PROCEDURES
11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP-1110-1-8	(2009) Construction Equipment Ownership and Operating Expense Schedule

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Earned Value Report; G

1.3 EARNED VALUE REPORT

1.3.1 Data Required

This contract requires the use of a cost-loaded Network Analysis Schedule (NAS). The information required for the Schedule of Prices will be entered as an integral part of the Network Analysis Schedule. Within 15 calendar days of notice of award, prepare and deliver to the Contracting Officer an Earned Value Report (construction contract) as directed by the Contracting Officer. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices. Costs shall be summarized and totals provided for each construction category.

1.3.2 Schedule Instructions

Payments will not be made until the Earned Value Report from the cost-loaded NAS has been submitted to and accepted by the Contracting Officer. Identify the cost for site work, and include incidental work to the 5 ft line. Identify costs for the building(s), and include work out to the 5 ft line. Work out to the 5 ft line shall include construction encompassed within a theoretical line 5 ft from the face of exterior walls and shall include attendant construction, such as pad mounted HVAC cooling equipment, cooling towers, and transformers placed beyond the 5 ft line.

1.3.3 Schedule Requirements for HVAC TAB

The field work Section 23 05 93 TESTING, ADJUSTING AND BALANCING shall be broken down in the Earned Value Report from the cost-loaded NAS by separate line items which reflect measurable deliverables. Specific payment percentages for each line item shall be determined on a case by case basis for each contract. The line items shall be as follows:

a. Approval of Design Review Report: The TABS Agency is required to conduct a review of the project plans and specifications to identify any feature, or the lack thereof, that would preclude successful testing and balancing of the project HVAC systems. The resulting findings shall be submitted to the Government to allow correction of the design. The progress payment shall be issued after review and approval of the report.

b. Approval of the pre-field engineering report: The TABS Agency submits a report which outlines the scope of field work. The report shall contain details of what systems will be tested, procedures to be used, sample report forms for reporting test results and a quality control checklist of work items that must be completed before TABS field work commences.

c. Season I field work: Incremental payments are issued as the TABS field work progresses. The TABS Agency mobilizes to the project site and executes the field work as outlined in the pre-field engineering report. The HVAC water and air systems are balanced and operational data shall be collected for one seasonal condition (either summer or winter depending on project timing).

d. Approval of Season I report: On completion of the Season I field work, the data is compiled into a report and submitted to the Government. The report is reviewed, and approved, after ensuring compliance with the pre-field engineering report scope of work.

e. Completion of Season I field QA check: Contract QC and Government representatives meet the TABS Agency at the jobsite to retest portions of the systems reported in the Season I report. The purpose of these tests are to validate the accuracy and completeness of the previously submitted Season I report.

f. Approval of Season II report: The TABS Agency completes all Season II field work, which is normally comprised mainly of taking heat transfer temperature readings, in the season opposite of that under which Season I performance data was compiled. This data shall be compiled into a report and submitted to the Government. On completion of submittal review to ensure compliance with the pre-field engineering report scope, progress payment is issued. Progress payment is less than that issued for the Season I report since most of the water and air balancing work effort is completed under Season I.

1.4 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause "DFARS 252.236-7000, Modification Proposals-Price Breakdown," and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, equipment use rates shall be based upon the applicable provisions of the EP-1110-1-8.

1.5 CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT

1.5.1 Content of Invoice

Requests for payment will be processed in accordance with the Contract Clause FAR 52.232-27, Prompt Payment Construction Contracts and FAR 52.232-5, Payments Under Fixed-Price Construction Contracts. The requests for payment shall include the documents listed below.

a. The Contractor's invoice, on NAVFAC Form 7300/30 furnished by the Government, showing in summary form, the basis for arriving at the amount of the invoice. Form 7300/30 shall include certification by Quality Control (QC) Manager as required by the contract.

b. The Earned Value Report from the cost-loaded NAS, showing in detail: the estimated cost, percentage of completion, and value of completed performance for each of the construction categories stated in this contract. Use NAVFAC LANT Form 4-330/110 (New 7/84) on NAVFAC LANT contracts when a Monthly Estimate for Voucher is required.

c. Updated Project Schedule and reports required by the contract.

d. Contractor Safety Self Evaluation Checklist.

e. Other supporting documents as requested.

f. Updated copy of submittal register.

g. Invoices not completed in accordance with contract requirements will be returned to the Contractor for correction of the deficiencies.

h. Contractor's Monthly Estimate for Voucher (NAVFAC LANT Form 4-330/110 (New 7/84)) with Subcontractor and supplier payment certification.

i. Affidavit to accompany invoice (NAVFAC LANT NORVA Form 4-4235/4 (Rev.5/81)).

j. Materials on Site.

1.5.2 Submission of Invoices

If NFAS Clause 5252.232-9301 is included in the contract, the documents listed in paragraph "CONTENT OF INVOICE" shall be provided in their entirety as attachments in Wide Area Work Flow (WAWF) for each invoice submitted. The maximum size of each WAWF attachment is two megabytes, but there are no limits on the number of attachments. If a document cannot be attached in WAWF due to system or size restriction it shall be provided as instructed by the Contracting Officer.

Monthly invoices and supporting forms for work performed through the anniversary award date of the contract shall be submitted to the Contracting Officer within 5 calendar days of the date of invoice. For example, contract award date is the 7th of the month, the date of each monthly invoice shall be the 7th and the invoice shall be submitted by the 12th of the month.

1.5.3 Final Invoice

a. A final invoice shall be accompanied by the certification required by

DFARS 252.247.7023 TRANSPORTATION OF SUPPLIES BY SEA, and the Contractor's Final Release. If the Contractor is incorporated, the Final Release shall contain the corporate seal. An officer of the corporation shall sign and the corporate secretary shall certify the Final Release.

b. For final invoices being submitted via WAWF, the original Contractor's Final Release Form and required certification of Transportation of Supplies by Sea must be provided directly to the respective Contracting Officer prior to submission of the final invoice. Once receipt of the original Final Release Form and required certification of Transportation of Supplies by Sea has been confirmed by the Contracting Officer, the Contractor shall then submit final invoice and attach a copy of the Final Release Form and required certification of Transportation of Supplies by Sea in WAWF.

c. Final invoices not accompanied by the Contractor's Final Release and required certification of Transportation of Supplies by Sea will be considered incomplete and will be returned to the Contractor.

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of itemized requests by the Contractor which comply with the requirements of this section, and will be subject to reduction for overpayments or increase for underpayments made on previous payments to the Contractor.

1.6.1 Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this contract will, at the discretion of the Contracting Officer, be subject to reductions and/or suspensions permitted under the FAR and agency regulations including the following in accordance with "FAR 32.503-6:

a. Reasonable deductions due to defects in material or workmanship;

b. Claims which the Government may have against the Contractor under or in connection with this contract;

c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor; and

d. Failure to provide up to date record drawings not current as stated in Contract Clause "FAC 5252.236-9310, Record Drawings."

1.6.2 Payment for Onsite and Offsite Materials

Progress payments may be made to the contractor for materials delivered on the site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.

b. Materials delivered on the site but not installed, including completed preparatory work, and off-site materials to be considered for progress payment shall be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of

materials acceptable for payment consideration include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings,precast/prestressed concrete products, plastic lumber (e.g., fender piles/curbs), and high-voltage electrical cable. Materials not acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.

c. Materials to be considered for progress payment prior to installation shall be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Earned Value Report requirement of this contract. Requests for progress payment consideration for such items shall be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 have been met.

d. Materials are adequately insured and protected from theft and exposure.

e. Provide a written consent from the surety company with each payment request for offsite materials.

f. Materials to be considered for progress payments prior to installation shall be stored either in Hawaii, Guam, Puerto Rico, or the Continental United States. Other locations are subject to written approval by the Contracting Officer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS
08/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View Location Map; G

Progress and Completion Pictures; G

1.3 VIEW LOCATION MAP

Submit, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

1.4 PROGRESS AND COMPLETION PICTURES

Photographically document site and buildingconditions prior to start of construction operations. Provide monthly, and within one month of the completion of work, digital photographs, 1600 by 1200 by 24 bit true color minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten views from points located by the Contracting Officer. Submit with the monthly invoice two sets of digital photographs, each set on a separate compact disc (CD) or data versatile disc (DVD), cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Provide photographs for each month in a separate monthly directory and name each file to indicate its location on the view location sketch. Also provide the view location sketch on the CD or DVD as a digital file. Include a date designator in file names. Cross reference submittals in the appropriate daily report. Photographs provided are for unrestricted use by the Government.

1.5 MINIMUM INSURANCE REQUIREMENTS

Provide the minimum insurance coverage required by FAR 28.307-2 LIABILITY, during the entire period of performance under this contract. Provide other insurance coverage as required by RI State law.

1.6 FIRST TIER CONTRACTOR REQUIREMENTS FOR ASBESTOS CONTAINING MATERIALS

Accomplish all contract requirements of Section 02 82 16.00 20 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS, 02 82 14.00 10 ASBESTOS HAZARD CONTROL ACTIVITIES, assigned to the Private Qualified Person, Designated Competent Person, directly with a first tier subcontractor.

1.7 SUPERVISION

1.7.1 Minimum Communication Requirements

Have at least one qualified superintendent, or competent alternate, capable of reading, writing, and conversing fluently in the English language, on the job-site at all times during the performance of contract work. In addition, if a Quality Control (QC) representative is required on the contract, then that individual must also have fluent English communication skills.

1.7.2 Superintendent Qualifications

The project superintendent must have a minimum of 10 years experience in construction with at least 5 of those years as a superintendent on projects similar in size and complexity. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance. The individual must be capable of interpreting a critical path schedule and construction drawings. The qualification requirements for the alternate superintendent are the same as for the project superintendent. The Contracting Officer may request proof of the superintendent's qualifications at any point in the project if the performance of the superintendent is in question.

For routine projects where the superintendent is permitted to also serve as the Quality Control (QC) Manager as established in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL, the superintendent must have qualifications in accordance with that section.

1.7.3 Non-Compliance Actions

The Project Superintendent is subject to removal by the Contracting Officer for non-compliance with requirements specified in the contract and for failure to manage the project to insure timely completion. Furthermore, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders is acceptable as the subject of claim for extension of time for excess costs or damages by the Contractor.

1.8 PRECONSTRUCTION MEETINGCONFERENCE

After award of the contract but prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule of prices or earned value

report, shop drawings, and other submittals, scheduling programming, prosecution of the work, and clear expectations of the "Interim DD Form 1354" Submittal. Major subcontractors who will engage in the work must also attend.

1.9 PARTNERING

To most effectively accomplish this contract, the Government requires the formation of a cohesive partnership within the Project Team whose members are from the Government, the Contractor and their Subcontractors. Key personnel from the Supported Command, the End User (who will occupy the facility), the Government Design and Construction team and Subject Matter Experts, the Installation, the Contractor and Subcontractors, and the Designer of Record will be invited to participate in the Partnering process. The Partnership will draw on the strength of each organization in an effort to achieve a project that is without any safety mishaps, conforms to the Contract, and stays within budget and on schedule.

The Contracting Officer will provide Information on the Partnering Process and a list of key and optional personnel who should attend the Partnering meeting.

1.9.1 Informal Partnering

The Contracting Officer will organize the Partnering Sessions with key personnel of the project team, including Contractor personnel and Government personnel.

The Initial Partnering session should be a part of the Pre-Construction Meeting. Partnering sessions will be held at a location agreed to by the Contracting Officer and the Contractor (typically a conference room provided by the PWD FEAD/ROICC Resident Engineer office or the Contractor). The Initial Informal Partnering Session will be conducted and facilitated using electronic media (a video and accompanying forms) provided by the Contracting Officer. The Partners will determine the frequency of the follow-on sessions, at no more than 3 to six month intervals.

1.10 ELECTRONIC MAIL (E-MAIL) ADDRESS

Establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments as text files, pdf files, and other similar formats. Within 10 days after contract award, provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use email to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes or terrorist threats. Multiple email addresses are not allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). Promptly notify the Contracting Officer, in writing, of any changes to this email address.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 32 17.00 20

COST-LOADED NETWORK ANALYSIS SCHEDULES (NAS)
02/15

PART 1 GENERAL

1.1 DESCRIPTION

The Contractor is responsible for scheduling procurement, Contractor quality control and construction, acceptance testing and training. Refer to Specification Section 01 33 00 SUBMITTAL PROCEDURES to determine if any items require Government approval prior to construction; if any are required, include that submittal review time in the schedule.

The schedule is a tool to manage the project, both for Contractor and Government activities. It will also be used to report progress and evaluate time extensions. The Project NAS must be cost-loaded and will provide the basis for progress payments. Use the Critical Path Method (CPM) and the Precedence Diagram Method (PDM) to satisfy time and cost applications. For consistency, when scheduling software terminology is used in this specification, the terms in Primavera's scheduling programs are used.

1.2 SUBMITTALS

The use of a "G" following a submittal indicates that a Government approval action is required. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Qualifications; G

Baseline Network Analysis Schedule (NAS); G

SD-07 Certificates

Monthly Network Analysis Schedule Update; G

SD-11 Closeout Submittals

As-Built Schedule; G

1.3 SCHEDULE ACCEPTANCE PRIOR TO START OF WORK

Participate with the Contracting Officer in a preliminary meeting(s) to discuss the proposed schedule and requirements of this section prior to the Contractor preparing the Project Baseline Schedule. Government review comments on the Contractor's schedule(s) do not relieve the Contractor from compliance with requirements of the Contract Documents. Only bonds may be paid prior to acceptance of the Baseline Network Analysis Schedule (NAS) The acceptance of a Baseline NAS is a condition precedent to:

a. The Contractor starting work on the demolition or construction stage(s) of the contract.

b. Processing Contractor's invoices(s) for construction activities/items

of work.

c. Review of any schedule updates.

Submittal of the Baseline Network Analysis Schedule, and subsequent schedule updates, is understood to be the Contractor's certification that the submitted schedule meets all of the requirements of the Contract Documents, represents the Contractor's plan on how the work will be accomplished, and accurately reflects the work that has been accomplished and how it was sequenced (as-built logic).

1.4 SOFTWARE

Prepare and maintain project schedules using Primavera P6. Importing data into P6 using data conversion techniques or third party software is cause for rejection of the submitted schedule.

A listing of Primavera P6 settings and parameters which must be used in preparing the Schedules are contained later in this specification section. Deviation from these settings and parameters, without prior consent of the Contracting Officer, is cause for rejection of schedule submission.

1.5 QUALIFICATIONS

The designated Scheduler for the project must have prepared and maintained at least 3 previous schedules of similar size and complexity of this contract using Primavera P3, Primavera SureTrak, or Primavera P6. At least one of the three must be in Primavera P6. Submit a resume outlining the qualifications of the Scheduler. Payment will not be processed until an acceptable Scheduler is provided.

1.6 NETWORK SYSTEM FORMAT

The system must include time-scaled logic diagrams and specified reports.

1.6.1 Diagrams

Provide Time-scaled Logic Diagram printed in color on ANSI D size sheets. The diagram must clearly show activities on the critical path. Include the following information for each activity:

a. Activity ID

b. Activity Description

c. Original Duration in Work Days

d. Remaining duration in Work Days

e. Physical Percent Complete

f. Start Date

g. Finish Date

h. Total Float

1.6.2 Schedule Activity Properties and Level of Detail

The NAS must identify all Government, Construction Quality Management (CQM), Construction activities planned for the project and all other activities that could impact project completion if delayed. Create separate activities for each Phase, Area, Floor Level and Location the activity is occurring. Activity categories included in the schedule are specified below.

With the exception of the Contract Award and Contract Completion Date (CCD) milestone activities, no activity shall be open-ended; each activity must have predecessor and successor ties. No activity must have open start or open finish (dangling) logic. Minimize redundant logic ties. Once an activity exists on the schedule it must not be deleted or renamed to change the scope of the activity and must not be removed from the schedule logic without approval from the Contracting Officer. While an activity cannot be deleted, where said activity is no longer applicable to the schedule but must remain within the logic stream for historical record, it can be changed to a milestone. Document any such change in the milestone's "Notebook", including a date and explanation for the change. The ID number for a deleted activity must not be re-used for another activity. Within the Baseline Schedule no more than 20 percent of the activities shall be critical or near critical. Critical is defined as having zero days of Total Float. "Near Critical" is defined as having Total Float of 1 to 14 days. Contractor activities must be driven by calendars that reflect Saturdays, Sundays and all Federal Holidays as non-work days.

1.6.2.1 Activity Categories

1.6.2.1.1 Procurement Activities

Examples of procurement activities include, but are not limited to; Material/equipment submittal preparation, submittal and approval of material/equipment; material/equipment fabrication and delivery, and material/equipment on-site. As a minimum, separate procurement activities will be provided for critical items, long lead items, items requiring Government approval and material/equipment procurement for which payment will be requested in advance of installation. Show each delivery with relationship tie to the Construction Activity specifically for the delivery.

1.6.2.1.2 Government Activities

Government and other agency activities that could impact progress must be clearly identified. Government activities include, but are not limited to; Government approved submittal reviews, Government conducted inspections/tests, environmental permit approvals by State regulators, utility outages, and delivery of Government Furnished Material/Equipment.

1.6.2.1.3 Quality Management (QM) Activities

The Preparatory Phase and Initial Phase for each Definable Feature of Work identified in the Contractor's Quality Control Plan must be added to each Three-Week Look Ahead Schedule referenced in the paragraph THREE-WEEK LOOK AHEAD SCHEDULE. The Follow-up Phase will be represented by the Construction Activities in the Baseline Schedule and in the schedule updates.

1.6.2.1.4 Construction Activities

No on-site construction activity may have a duration in excess of 20 working days. Contractor activities must be driven by calendars that reflect Saturdays, Sundays and all Federal Holidays as non-work days, unless otherwise defined in this contract.

1.6.2.1.5 Turnover and Closeout Activities

Include activities with all items on the NAVFAC Red Zone Checklist/POAM that are applicable to this project. As a minimum, include all testing, specialized inspection activities, Pre-Final Inspection, Punch List Completion, Final Inspection and Acceptance. Add a milestone for the Facility Turnover Planning Meeting at approximately 75 percent construction contract completion or three to six months prior to Contract Completion Date (CCD), whichever is sooner.

1.6.2.2 Contract Milestones and Constraints

1.6.2.2.1 Project Start Date Milestones

Include as the first activity on the schedule a start milestone titled "Contract Award", which must have a Mandatory Start constraint equal to the Contract Award Date.

1.6.2.2.2 Facility Turnover Planning Meeting Milestones

See paragraph ACTIVITY CATEGORIES above.

1.6.2.2.3 Substantial Completion Milestone

Include an unconstrained finish milestone on the schedule titled "Substantial Completion". Substantial Completion is defined as the point in time the Government would consider the project ready for beneficial occupancy wherein by mutual agreement of the Government and Contractor, Government use of the facility is allowed while construction access continues in order to complete remaining items (e.g. punch list and other close out submittals).

1.6.2.2.4 Projected Completion Milestone

Include an unconstrained finish milestone on the schedule titled "Projected Completion". Projected Completion is defined as the point in time the Government would consider the project complete. This milestone must have the Contract Completion (CCD) milestone as its only successor.

1.6.2.2.5 Contract Completion Date (CCD) Milestone

Include as the last activity on the schedule a finish milestone titled "Contract Completion (CCD)". Calculation of schedule updates must be such that if the finish of the "Projected Completion" milestone falls after the contract completion date, then negative float will be calculated on the longest path and if the finish of the "Projected Completion" milestone falls before the contract completion date, the float calculation must reflect positive float on the longest path.

1.6.2.3 Work Breakdown Structure & Activity Code

At a minimum, the Contractor must establish a Work Breakdown Structure

(WBS) and provide activity codes identified as follows:

1.6.2.3.1 Work Breakdown Structure (WBS)

Group all activities and milestones within appropriate WBS categories including, at a minimum, the following:

a. Project Milestones:

    1. Management Milestones

    2. Project Administrative Meetings

b. Pre-Construction Phase:

    1. Submittals and Reviews

    2. Procurement

c. Construction Phase; Create multiple sub-sections in accordance with project specific categories of work including in WBS descending order as follows:

    1. General Area

        (a) Type of Work Item

            1. Location

d. Commissioning & Testing:

    1. Specific area/locations of commissioning

    2. Final Testing

    3. Training

e. Project Closeout: Include activity items such as Punchlist, Demobilization, O&M, As-built Drawings, and As-built NAS.

f. Modifications: Create multiple sub-sections as the project progresses identified by modifications issued.

1.6.2.3.2 Responsibility Code

All activities in the project schedule must be identified with the party responsible for completing the task. Activities must not belong to more than one responsible party.

1.6.2.4 Anticipated Weather Lost Work Days

Use the National Oceanic and Atmospheric Administration's (NOAA) historical monthly averages for days with precipitation, using a nominal 30-year, greater than 0.10 inch amount parameter, as indicated on the Station Report for the NOAA location closest to the project site as the basis for establishing a "Weather Calendar" showing the number of anticipated non-workdays for each month due to adverse weather, in addition to Saturdays, Sundays and all Federal Holidays as non-work days.

Assign the Weather Calendar to any activity that could be impacted by adverse weather. The Contracting Officer will issue a modification in accordance with the contract clauses, giving the Contractor a time extension for the difference of days between the anticipated and actual adverse weather delay if the number of actual adverse weather delay days exceeds the number of days anticipated for the month in which the delay occurs and the adverse weather delayed activities are critical to contract completion. A lost workday due to weather conditions is defined as a day in which the Contractor cannot work at least 50 percent of the day on the impacted activity.

1.6.2.5 Cost Loading

1.6.2.5.1 Cost Loading Activities

Assign Material and Equipment Costs, for which payment will be requested in advance of installation, to their respective procurement activity (i.e., the material/equipment on-site activity). Assign cost for material/equipment, paid for after installation; labor; and construction equipment to their respective Construction Activities. The value of commissioning, testing and closeout WBS section may not be less than 10 percent of the total costs for Procurement and Construction Activities. Evenly disperse overhead and profit to each activity over the duration of the project.

1.6.2.5.2 Quantities and Units of Measure

Each cost loaded activity must have a detailed quantity breakdown and unit of measure. Lump sum costing is not acceptable.

1.6.3 Schedule Software Settings and Restrictions

a. Activity Constraints: Date/time constraint(s), other than those required by the contract, are not allowed unless accepted by the Contracting Officer. Identify any constraints proposed and provide an explanation for the purpose of the constraint in the Narrative Report as described in paragraph REQUIRED TABULAR REPORTS.

b. Default Progress Data Disallowed: Actual Start and Actual Finish dates on the CPM schedule must match the dates on the Contractor Quality Control and Production Reports.

c. Software Settings: Handle schedule calculations and Out-of-Sequence progress (if applicable) through Retained Logic, not Progress Override. Show all activity durations and float values in days. Show activity progress using Remaining Duration. Set default activity type to "Task Dependent".

d. At a minimum, include the following settings and parameters in Baseline Schedule preparation:

1. General: Define or establish Calendars and Activity Codes at the "Project" level, not the "Global" level.

2. Admin Drop-Down Menu, Admin Preferences, Time Periods Tab:

(a) Set time periods for P6 to 8.0 Hours/Day, 40.0 Hours/Week, 172.0 Hours/Month and 2000.0 Hours/Year.

(b) Use assigned calendar to specify the number of work hours for each time period: Must be checked.

3. Admin Drop-Down Menu, Admin Preferences, Earned Value Tab:

(a) Earned Value Calculation: Use "Budgeted values with current dates".

4. Project Level, Dates Tab:

(a) Set "Must Finish By" date to "Contract Completion Date".

5. Project Level, Defaults Tab:

(a) Duration Type: Set to "Fixed Duration & Units".

(b) Percent Complete Type: Set to "Physical".

(c) Activity Type: Set to "Task Dependent".

(d) Calendar: Set to "Standard 5 Day Workweek". Calendar must reflect Saturday, Sunday and all Federal holidays as non-work days. Alternative calendars may be used with Contracting Officer approval.

6. Project Level, Calculations Tab:

(a) Activity percent complete based on activity steps: Must be Checked.

(b) Reset Remaining Duration and Units to Original: Must be Checked.

(c) Subtract Actual from At Completion: Must be Checked.

(d) Recalculate Actual units and Cost when duration percent(%) complete changes: Must be Checked.

(e) Link Actual to Date and Actual This Period Units and Cost: Must be Checked.

(f) Price/Unit: Set to "$1/h".

(g) Update units when costs change on resource assignments: Must be Unchecked.

7. Project Level, Settings Tab:

(a) Define Critical Activities: Check "Total Float is less than or equal to" and add "0d".

8. Work Breakdown Structure Level, Earned Value Tab:

(a) Technique for Computing Performance Percent Complete: "Activity percent complete" is selected.

(b) Technique for Computing Estimate to Complete (ETC): "PF = 1" is selected.

1.6.4 Required Tabular Reports

Include the following reports with the Baseline, Monthly Update and any other required schedule submittals:

a. Log Report: Listing of all changes made between the previous schedule and current updated schedule.

b. Narrative Report: Identify and justify:

1. Progress made in each area of the project;

2. Critical Path;

3. Date/time constraint(s), other than those required by the contract

4. Changes in the following; added or deleted activities, original and remaining durations for activities that have not started, logic, milestones, planned sequence of operations, critical path, and cost loading;

5. Any decrease in previously reported activity Earned Amount;

6. Pending items and status thereof, including permits, changes orders, and time extensions;

7. Status of Contract Completion Date and interim milestones;

8. Current and anticipated delays (describe cause of delay and corrective actions(s) and mitigation measures to minimize);

9. Description of current and future schedule problem areas.

Each entry in the narrative report must cite the respective Activity ID and Activity Description, the date and reason for the change, and description of the change.

c. Earned Value Report: List all activities having a budget amount cost loaded. Compile total earnings on the project from notice to proceed to current progress payment request. Show current budget, previous physical percent complete, to-date physical percent complete, previous earned value, to-date earned value and cost to complete on the report for each activity.

d. Schedule Variance Control (SVC) Diagram: With each schedule submission, provide a SVC diagram showing 1) Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates and 2) Earned Value to-date. Revise Cash Flow S-Curves when the contract is modified, or as directed by the Contracting Officer.

1.7 SUBMISSION AND ACCEPTANCE

1.7.1 Monthly Network Analysis Updates

Meet with Government representatives at monthly intervals to review and agree on the information presented in the updated project schedule. The submission of an acceptable, updated schedule to the Government is a condition precedent to the processing of the Contractor's invoice. Submit

an acceptable, updated schedule to the Government regardless of whether a Contractor's invoice is submitted for the given period. The Contractor and Government must consent to agree on percentage of payment for each activity progressed during the update period. Monthly update schedules must incorporate as-built events as they occurred and provide ongoing status of anticipated finish dates. As-built events must correspond to contemporaneous records including but not limited to submittals, daily production reports and quality control reports.

Provide the following with each Schedule submittal:

a. Time-Scaled Logic Diagram.

b. Reports listed in paragraph entitled "REQUIRED TABULAR REPORTS."

c. Data disks containing the project schedule. Include the back-up native .xer program files.

1.7.2 As-Built Schedule

As a condition precedent to the release of retention and making final payment, submit an "As-Built Schedule," as the last schedule update showing all activities at 100 percent completion. This schedule must reflect the exact manner in which the project was actually constructed.

1.8 CONTRACT MODIFICATION

Submit a Time Impact Analysis (TIA) with each cost and time proposal for a proposed change. TIA must illustrate the influence of each change or delay on the Contract Completion Date or milestones. No time extensions will be granted nor delay damages paid unless a delay occurs which consumes all available Project Float, and extends the Projected Finish beyond the Contract Completion Date.

a. Each TIA must be in both narrative and schedule form. The narrative must define the scope and conditions of the change; provide start and finish dates of impact, successor and predecessor activity to impact period, responsible party; describe how it originated, and how it impacts the schedule. The schedule submission must consist of three native files:

   1. Fragnet used to define the scope of the changed condition

   2. Most recent accepted schedule update as of the time of the proposal or claim submission that has been updated to show all activity progress as of the time of the impact start date.

   3. The impacted schedule that has the fragnet inserted in the updated schedule and the schedule “run” so that the new completion date is determined.

b. For claimed as-built project delay, the inserted fragnet TIA method must be modified to account for as-built events known to occur after the data date of schedule update used.

c. All TIAs must include any mitigation, and must determine the apportionment of the overall delay assignable to each individual delay. The associated narrative must clearly describe the findings in a chronological listing beginning with the earliest delay event.

1. Identify types of delays as follows:

   (a) Excusable Delay: Force-Majeure (e.g. weather) - Contractor may receive time extension, but time will not be compensable.

   (b) Inexcusable Delay: Contractor Responsibility – Contractor will not receive time extension.

   (c) Compensable Delay: Government Responsibility – Contractor may receive compensable time extension.

2. If a combination of delay types occurs, it is considered Concurrent Delay, which is defined in the following combinations:

   (a) Excusable Delay and Compensable Delay results in Excusable Delay

   (b) Excusable Delay and Inexcusable Delay results in Inexcusable Delay

   (c) Compensable Delay and Inexcusable Delay results in Excusable Delay

d. Submit Data disks containing the narrative and native schedule files.

e. Unless the Contracting Officer requests otherwise, only add conformed contract modifications into the Project NAS.

1.8.1 No Reservation of Rights

All direct costs, indirect cost, and time extensions will be negotiated and made full, equitable and final at the time of modification issuance.

1.9 PROJECT FLOAT

Project Float is the length of time between the Contractor's Projected Completion Milestone and the Contract Completion Date Milestone. Project Float available in the schedule will not be for the exclusive use of either the Government or the Contractor.

The use of Resource Leveling or other techniques used for the purpose of artificially adjusting activity durations to consume float and influence critical path is prohibited.

1.10 THREE-WEEK LOOK AHEAD SCHEDULE

Prepare and issue a 3-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Project Network Analysis Schedule. Key the work plans to NAS activity numbers and update each week to show the planned work for the current and following two-week period. Additionally, include upcoming outages, closures, field evaluation tests, preparatory meetings, and initial meetings. Identify critical path activities on the Three-Week Look Ahead Schedule. The detail work plans are to be bar chart type schedules, derived from but maintained separately from the Project NAS on an electronic spreadsheet program and printed on 8-1/2 by 11 inch sheets as directed by the Contracting Officer. Activities must not exceed 5 working days in

duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work. Deliver three hard copies and one electronic file of the 3-Week Look Ahead Schedule to the Contracting Officer no later than 8 a.m. each Monday and review during the weekly CQC Coordination or Production Meeting.

1.11 CORRESPONDENCE AND TEST REPORTS

All correspondence (e.g., letters, Requests for Information (RFIs), e-mails, meeting minute items, Production and QC Daily Reports, material delivery tickets, photographs) must reference Schedule activity IDs that are being addressed. All test reports (e.g., concrete, soil compaction, weld, pressure) must reference schedule activity IDs that are being addressed.

1.12 ADDITIONAL SCHEDULING REQUIREMENTS

Any references to additional scheduling requirements, including systems to be inspected, tested and commissioned, that are located throughout the remainder of the Contract Documents, are subject to all requirements of this section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES
05/11

PART 1 GENERAL

1.1 SUMMARY

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

A submittal register showing items of equipment and materials for when submittals are required by the specifications is provided as "Appendix A - Submittal Register".

1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work). issuance of contract notice to proceed.or commencing work on site.or the start of the next major phase of the construction on a multi-phase contract, includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction progress schedule

Network Analysis Schedule (NAS)

Submittal register

Schedule of prices or Earned Value Report

Health and safety plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS)concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the

job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.2.2 Approving Authority

Office or designated person authorized to approve submittal.

1.2.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor QC approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register; G

1.4 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.4.1 Government Approved (G)

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are considered to be "shop drawings."

1.5 FORWARDING SUBMITTALS REQUIRING GOVERNMENT APPROVAL

1.5.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the Commander, NAVFAC and the Architect-Engineer: Submittals required in the technical sections of this specification, including shop drawings, product data and samples. Forward one copy of the transmittal form for all submittals to the Resident Officer in Charge of Construction.

The Architect-Engineer for this project will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

1.5.1.1 O&M Data

The Architect-Engineer for this project will review and approve for the Contracting Officer O&M Data to verify the submittals comply with the contract requirements; submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.5.1.2 Submittals Reserved for NAVFAC Approval

As an exception to the standard submittal procedure specified above, submit the following to the Commander, NAVFAC:

a. All fire protection system submittals

b. All fire alarm system submittals

c. Section 23 09 53.00 20 SPACE TEMPERATURE CONTROL SYSTEMS: SD-06 field test report submittals

d. Section 23 09 23.13 20 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC: SD-06 field test report submittals

e. Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC: All submittals

f. Section 26 12 19.10 THREE-PHASE PAD-MOUNTED TRANSFORMERS: All submittals

1.6 PREPARATION

1.6.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels to office of approving authority. Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph IDENTIFYING SUBMITTALS of this section.

1.6.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction contract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.6.3 Format for SD-02 Shop Drawings

Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph

IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than 3 inches on the right hand side of each sheet for the Government disposition stamp.

Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Include the nameplate data, size and capacity on drawings. Also include applicable federal, military, industry and technical society publication references.

Submit drawings PDF format.

1.6.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.

Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of SD-07 Certificates.

Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, submit as specified for SD-07 Certificates.

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the

product data identically. Partial submittals will not be accepted for expedition of construction effort.

Submit manufacturer's instructions prior to installation.

1.6.5 Format of SD-04 Samples

Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at time of use.

Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.

1.6.6 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.6.7 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

1.6.8 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.6.9 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

1.6.10 Source Drawings for Shop Drawings

The entire set of Source Drawing files (DWG) will not be provided to the Contractor. Only those requested by the Contractor to prepare shop drawings may be provided. Request the specific Drawing Number only for the preparation of Shop Drawings. These drawings may only be provided after award.

1.6.10.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic Source Drawing files are not construction documents. Differences may exist between the Source Drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic Source Drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source Drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic Source Drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.6.11 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. In addition to the electronic submittal, provide three hard copies of the submittals. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Electronic format shall be in PDF, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature, or scan of a signature.

Email electronic submittal documents fewer than 10MB to an email address as directed by the Contracting Officer. Provide electronic documents over 10MB on an optical disc, or through an electronic file sharing system such as the AMRDEC SAFE Web Application located at the following website: https://safe.amrdec.army.mil/safe/.

Provide hard copies of submittals when requested by the Contracting Officer. Up to 3 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the Government.

1.7 QUANTITY OF SUBMITTALS

1.7.1 Number of Copies of SD-02 Shop Drawings

Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer.

1.7.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

1.7.3 Number of Samples SD-04 Samples

a. Submit one samples, or one set of samples showing range of variation, of each required item.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

1.7.4 Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop

drawings.

1.7.5 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

1.7.6 Number of Copies of SD-10 Operation and Maintenance Data

Submit five copies of O&M Data to the Contracting Officer for review and approval.

1.7.7 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit three sets of administrative submittals.

1.8 VARIATIONS

Variations from contract requirements require both Designer of Record (DOR) and Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

1.8.1 Considering Variations

Discussion with Contracting Officer prior to submission, after consulting with the DOR, will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

1.8.2 Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government, including the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.8.3 Warranting that Variations are Compatible

When delivering a variation for approval, Contractor, including its Designer(s) of Record, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.8.4 Review Schedule is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with

variations.

1.9 SUBMITTAL REGISTER AND DATABASE

Prepare and maintain submittal register, as the work progresses. Use electronic submittal register program furnished by the Government or any other format. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.10 10 QUALITY CONTROL SYSTEM (QCS).

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal.

1.9.1 Use of Submittal Register

Submit submittal register as an electronic database, using submittals management program furnished to Contractor. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register database submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.9.2 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor with each submittal throughout contract.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record

Contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.9.3 Approving Authority Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (l) List date of submittal receipt.

Column (m) through (p) List Date related to review actions.

Column (q) List date returned to Contractor.

1.9.4 Action Codes

Entries for columns (j) and (o), are to be used are as follows (others may be prescribed by Transmittal Form):

1.9.4.1 Government Review Action Codes

"A" - "Approved as submitted"; "Completed"

"B" - "Approved, except as noted on drawings"; "Completed"

"C" - "Approved, except as noted on drawings; resubmission required"; "Resubmit"

"D" - "Returned by separate correspondence"; "Completed"

"E" - "Disapproved (See attached)"; "Resubmit"

"F" - "Receipt acknowledged"; "Completed"

"G" - "Other (Specify)"; "Resubmit"

"X" - "Receipt acknowledged, does not comply with contract requirements"; "Resubmit"

1.9.4.2 Contractor Action Codes

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.10 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications

to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals. An additional 10 calendar days will be allowed and shown on the register for review and approval of submittals for refrigeration and HVAC control systems.

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

e. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals for Contracting Officer approval. Period of review for submittals with Contracting Officer approval begins when Government receives submittal from QC organization.

f. For submittals requiring review by fire protection engineer, allow review period, beginning when Government receives submittal from QC organization, of 30 working days for return of submittal to the Contractor.

g. Period of review for each resubmittal is the same as for initial submittal.

1.10.1 Reviewing, Certifying, Approving Authority

The QC organization is responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC Manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates Contracting Officer is approving authority for that submittal item. An "S" following a submittal item, indicates that the QC Manager is the approving authority, and that a copy of the approved submittal must be provided to the Designer of Record.

1.10.2 Constraints

Conform to provisions of this section, unless explicitly stated otherwise for submittals listed or specified in this contract.

Submit complete submittals for each definable feature of work. Submit at the same time components of definable feature interrelated as a system.

When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.

Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.10.3 QC Organization Responsibilities

a. Note date on which submittal was received from Contractor on each submittal.

b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.

c. Review submittals for conformance with project design concepts and compliance with contract documents.

d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

   1. When QC Manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph APPROVED SUBMITTALS.

   2. When Contracting Officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

e. Ensure that material is clearly legible.

f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

   1. When approving authority is Contracting Officer, QC organization will certify submittals forwarded to Contracting Officer with the following certifying statement:

   "I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

   Certified by Submittal Reviewer _____, Date _____
   (Signature when applicable)

   Certified by QC Manager _____, Date _____"
   (Signature)

   (2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to

Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Approved by QC Manager _____, Date _____"
(Signature)

g. Sign certifying statement or approval statement. The QC organization member designated in the approved QC plan is the person signing certifying statements. The use of original ink for signatures is required. Stamped signatures are not acceptable.

h. Update submittal register as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by Contracting Officer.

i. Retain a copy of approved submittals at project site, including Contractor's copy of approved samples.

j. For "S" submittals, provide a copy of the approved submittal to the Designer of Record.

1.11 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received from QC Manager.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. Two copies of the submittal will be retained by the Contracting Officer and remaining copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.11.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" "or approved, except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

1.12 DISAPPROVED OR REJECTED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the Contract clause CHANGES, is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.13 APPROVED/ACCEPTED SUBMITTALS

The Contracting Officer's approval or acceptance of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory. design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal.

Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.14 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the

project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

1.15 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.16 PROGRESS SCHEDULE

1.16.1 Project Network Analysis

Submit the initial progress schedule within 21 calendar days of notice to proceed. Schedule is to be updated and resubmitted monthly beginning 7 calendar days after return of the approved initial schedule. Updating to entail complete revision of the graphic and data displays incorporating changes in scheduled dates and performance periods. Redlined updates will only be acceptable for use as weekly status reviews.

Contractor to provide a single point contact from his on-site organization as his Schedule Specialist. Schedule Specialist is to have the responsibility of updating and coordinating the schedule with actual job conditions. Schedule Specialist to participate in weekly status meetings and present current information on the status of purchase orders, shop drawings, off-site fabrication, materials deliveries, Subcontractor activities, anticipated needs for Government furnished equipment, and any problem which may impact the contract performance period.

Include the following in the project network analysis:

a. Graphically display with the standard network or arrow diagram capable of illustrating the required data. Drafting to be computer generated

on standard 24 by 36 inch (nominal size) drafting sheets or on small 11 by 17 inch minimum sheets with separate overview and detail breakouts. Provide a project network analysis that is legible with a clear, consistent method for continuations and detail referencing. Clearly delineate the critical path on the display. Clearly indicate the contract milestone date on the project network analysis graphic display.

b. Data is to be presented as a separate printout on paper or, where feasible, may be printed on the same sheet as the graphic display. Data is to be organized in a logical coherent display capable of periodic updating.

c. Include within the data verbal activity descriptions with a numerical ordering system cross referenced to the graphic display. Additionally, costs (broken down into separate materials and costs), duration, early start date, early finish date, late start date, late finish date, and float are to be detailed for each activity. A running total of the percent completion based on completed activity costs versus total contract cost is to be indicated. A system for indicating scheduled versus actual activity dates and durations is also to be provided.

d. Sufficient detail to facilitate the Contractor's control of the job and to allow the Contracting Officer to readily follow progress for portions of the work should be shown within the schedule.

1.17 STATUS REPORT ON MATERIALS ORDERS

Within 5 calendar days after notice to proceed, submit, for approval by the Contracting Officer, an initial material status report on all materials orders. This report will be updated and re-submitted every 30 calendar days as the status on material orders changes.

Report to include list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will be required for each material order listed:

a. Material name, supplier, and invoice number.

b. Bar chart line item or CPM activity number affected by the order.

c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.

d. Current delivery date agreed on by supplier.

e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.

f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 20 00.00 20	SD-01 Preconstruction Submittals															
			Earned Value Report	1.3	G													
		01 30 00	SD-01 Preconstruction Submittals															
			View Location Map	1.3	G													
			Progress and Completion	1.4	G													
			Pictures															
		01 32 17.00 20	SD-01 Preconstruction Submittals															
			Qualifications	1.5	G													
			Baseline Network Analysis	1.3	G													
			Schedule															
			SD-07 Certificates															
			Monthly Network Analysis	1.7.1	G													
			SD-11 Closeout Submittals															
			As-Built Schedule	1.7.2	G													
		01 33 00	SD-01 Preconstruction Submittals															
			Submittal Register	1.9	G													
		01 35 26	SD-01 Preconstruction Submittals															
			Accident Prevention Plan (APP)	1.8	G													
			SD-06 Test Reports															
			Monthly Exposure Reports	1.4														
			Notifications and Reports	1.13														
			Accident Reports	1.13.2	G													
			LHE Inspection Reports	1.13.3														
			SD-07 Certificates															
			Contractor Safety Self-Evaluation	1.5														
			Checklist															

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 35 26	Crane Operators/Riggers	1.7.1.5														
			Standard Lift Plan	1.8.2.2	G													
			Naval Architecture Analysis	1.8.2.3	G													
			Activity Hazard Analysis (AHA)	1.9														
			Confined Space Entry Permit	1.10.1														
			Hot Work Permit	1.10.1														
			Certificate of Compliance	1.13.4														
			Third Party Certification of															
			Barge-Mounted Mobile Cranes															
			License Certificates	1.15														
			Radiography Operation Planning	1.15.1	G													
			Work Sheet															
		01 45 00.00 20	SD-01 Preconstruction Submittals															
			Construction Quality Control (QC)	1.6.1	G													
			Plan															
			Indoor Air Quality (IAQ)	1.16	G													
			Management Plan															
		01 45 35	SD-01 Preconstruction Submittals															
			Written Practices	3.1.2														
			SD-06 Test Reports															
			Daily Reports	3.1.2														
			Biweekly Reports	3.1.1														
			SD-07 Certificates															
			Special Inspector	1.5	G													
			SD-11 Closeout Submittals															
			Comprehensive Final Report	2.1	G													

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 45 35	Comprehensive Final Report	3.1.2	G													
		01 50 00	SD-01 Preconstruction Submittals															
			Construction Site Plan	1.3	G													
			Traffic Control Plan	3.4.1	G													
			SD-03 Product Data															
			Backflow Preventers	1.4	G													
			SD-06 Test Reports															
			Backflow Preventer Tests	2.2.5														
			SD-07 Certificates															
			Backflow Tester	1.4.1														
			Backflow Preventers	1.4														
		01 57 19	SD-01 Preconstruction Submittals															
			Preconstruction Survey	1.5.1														
			Solid Waste Management Permit	1.8	G													
			Regulatory Notifications	1.5.2	G													
			Environmental Protection Plan	1.6	G													
			Stormwater Notice of Intent		G													
			Dirt and Dust Control Plan	1.6.9.1	G													
			SD-06 Test Reports															
			Laboratory Analysis															
			Inspection Reports	3.1.1														
			Solid Waste Management Report	1.8.1	G													
			SD-07 Certificates															
			ECATTS Certificate Of	1.4.1.2	G													
			Completion															
			Certificate of Competency															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 57 19	Erosion and Sediment Control															
			Inspector															
			SD-11 Closeout Submittals															
			Stormwater Pollution Prevention		G													
			Plan Compliance Notebook															
			Stormwater Notice of Termination		G													
			Disposal Documentation for	3.4.3.6	G													
			Hazardous and Regulated Waste															
			Solid Waste Management Permit	1.8	G													
			Contractor Hazardous Material	3.5.1	G													
			Inventory Log															
			Hazardous Waste/Debris	3.4.3.1	G													
			Management															
			Regulatory Notifications	1.5.2	G													
			Contractor Certification															
		01 58 00	SD-02 Shop Drawings															
			Preliminary drawing indicating	1.4.1	G													
			layout and text content															
		01 74 19	SD-01 Preconstruction Submittals															
			Waste Management Plan	1.5	G													
			SD-11 Closeout Submittals															
			Records	1.6														
		01 78 00	SD-03 Product Data															
			Warranty Management Plan	1.6.1														
			Warranty Tags	1.6.4														
			Final Cleaning	3.3														

SUBMITTAL REGISTER

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NGIS B678

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 78 00	Spare Parts Data	1.5														
			SD-08 Manufacturer's Instructions															
			Instructions	1.6.1														
			SD-11 Closeout Submittals															
			As-Built Drawings	3.1	G													
			Record Drawings	3.2	G													
			Final Approved Shop Drawings															
			Construction Contract															
			Specifications															
			Certification of EPA Designated	2.1	G													
			Items															
			Interim DD FORM 1354	3.4	G													
			Checklist for DD FORM 1354	3.4	G													
			NAVFAC Sustainable & Energy	3.5	G													
			Data Record Card															
		01 78 23	SD-10 Operation and Maintenance															
			Data															
			O&M Database		G													
			Training Plan	3.1.1	G													
			Training Outline	3.1.3	G													
			Training Content	3.1.2	G													
			SD-11 Closeout Submittals															
			Validation of Training Completion	3.1.5	G													
		01 78 24.00 20	SD-11 Closeout Submittals															
			eOMSI, Progress Submittal	1.4.1	G													
			eOMSI, Prefinal Submittal	1.4.2	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		01 78 24.00 20	eOMSI, Final Submittal	1.4.3	G													
		01 91 00.00 40	SD-01 Preconstruction Submittals															
			Commissioning Plan	2.1.1	G													
			Commissioning Schedule	2.1.1	G													
			SD-05 Design Data															
			Basis of Design	1.6	G													
			SD-06 Test Reports															
			Functional Performance Testing	3.2.5	G													
			Results															
			Deficiency Report and Resolution	3.1	G													
			Record															
			SD-07 Certificates															
			Commissioning Agents	1.5	G													
			Qualifications															
			SD-10 Operation and Maintenance															
			Data															
			Operations and Maintenance	3.4	G													
			Manuals															
			Training Plan	3.4	G													
			SD-11 Closeout Submittals															
			Final Commissioning Report	3.1	G													
			Warranty	3.1	G													
		02 41 00	SD-01 Preconstruction Submittals															
			Existing Conditions	1.9	G													
			SD-07 Certificates															
			Demolition Plan	1.2.1	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		02 41 00	Notification	1.6	G													
			SD-11 Closeout Submittals															
			Receipts	3.14.2														
		02 81 00	SD-03 Product Data															
			Onsite Hazardous Waste	3.1	G													
			Management															
			Notices of Non-Compliance and	3.2														
			Notices of Violation															
			Packaging Notifications	2.1.1														
			SD-06 Test Reports															
			Recordkeeping	3.7	G													
			Spill Response	3.8	G													
			Exception Report	3.7														
			SD-07 Certificates															
			Certification	1.4.3														
			Security Plan	3.2.4	G													
			Transportation and Disposal	1.4.1	G													
			Coordinator															
			Training	1.4.2	G													
			EPA Offsite Policy	3.2.2														
			Certificates of Disposal	3.2.5	G													
			Shipping Documents and	3.2.3	G													
			Packagings Certification															
			Waste Minimization	3.6	G													
		02 82 16.00 20	SD-03 Product Data															
			Local exhaust equipment	3.1.4	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02 82 16.00 20	Vacuums	3.1.5	G													
			Respirators	3.1.1.1	G													
			Pressure differential automatic	3.1.4	G													
			recording instrument															
			Amended water	1.2.2	G													
			Glovebags	3.1.7	G													
			Material Safety Data Sheets	1.3.8	G													
			(MSDS) for all materials															
			Encapsulants	2.1	G													
			SD-06 Test Reports															
			Air sampling results	1.5.5	G													
			Pressure differential recordings	1.5.6	G													
			for local exhaust system															
			Asbestos disposal quantity report	3.3.3.2	G													
			Encapsulation test patches		G													
			Clearance sampling	3.2.7.3	G													
			SD-07 Certificates															
			Asbestos hazard abatement plan	1.3.9	G													
			Testing laboratory	1.3.10	G													
			Private qualified person	1.5.1	G													
			documentation															
			Contractor's license	1.5.4	G													
			Competent person	1.5.2	G													
			Worker's license	1.5.3	G													
			Landfill approval	1.3.11	G													
			Employee training	1.3.3	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		02 82 16.00 20	Medical certification	1.3.12	G													
			Waste shipment records	1.3.11	G													
			Respiratory Protection Program	1.3.6	G													
			Delivery tickets	1.3.11	G													
			Vacuums	3.1.5	G													
			Water filtration equipment	3.1.2.3	G													
			Ventilation systems	3.1.5	G													
			equipment used to contain	3.1	G													
			airborne asbestos fibers															
			encapsulants	2.1	G													
			Notifications	1.3.4	G													
			SD-11 Closeout Submittals															
			Notifications	1.3.4	G													
			Rental equipment	1.6.1	G													
			Respirator program records	1.3.6.1	G													
			Permits and licenses	1.3.4	G													
		02 83 13.00 20	SD-01 Preconstruction Submittals															
			Occupational and Environmental	1.5.2.3	G													
			Assessment Data Report															
			Lead Compliance Plan	1.5.2.2	G													
			Competent Person	1.5.1.1	G													
			Training Certification	1.5.1.2	G													
			lead waste management plan	1.5.2.8	G													
			written evidence	3.5.2.1	G													
			Medical Examinations	1.5.2.4	G													
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02 83 13.00 20	sampling results	1.5.2.3	G													
			Occupational and Environmental	1.5.2.3	G													
			Assessment Data Report															
			SD-07 Certificates															
			Testing laboratory	1.5.1.3	G													
			Occupant Notification		G													
			Third party consultant	1.5.1.4	G													
			qualifications															
			Clearance Certification	3.5.1.1	G													
			SD-11 Closeout Submittals															
			hazardous waste manifest	3.5.2.1	G													
			turn-in documents or weight	3.5.2.1	G													
			tickets															
		02 84 16	SD-07 Certificates															
			Qualifications of CIH	1.8.1	G													
			Training Certification	1.8.1	G													
			PCB and Lamp Removal Work	1.8.2	G													
			Plan															
			PCB and Lamp Disposal Plan	1.8.3	G													
			SD-11 Closeout Submittals															
			Transporter certification	3.5.2	G													
			Certification of Decontamination	3.2.4	G													
			Certificate of Disposal and/or	3.5.2.1	G													
			recycling															
			DD Form 1348-1	3.5.3.2														
			Testing results	3.3.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		02 85 00.00 20	SD-01 Preconstruction Submittals															
			Preliminary Visual Assessment	1.4.1.1	G													
			Report															
			Microbial Remediation Plan	1.4.1.2	G													
			Worker Records	1.4.1.4	G													
			Respiratory Protection Program	1.4.1.3	G													
			Certified Industrial Hygienist	1.4.1.5	G													
			(CIH)/Industrial Hygienist (IH)															
			Qualifications															
			Microbial Remediation Supervisor	1.4.1.6	G													
			Qualifications															
			Ventilation System Mold	1.2.24	G													
			Remediator Qualifications															
			Ventilation System Mold	3.5.1	G													
			Remediator Qualifications															
			SD-03 Product Data															
			Personal Protective Equipment	1.2.19	G													
			(PPE)															
			Air Filtration Units	3.1.5	G													
			Dehumidifiers	3.1.4	G													
			Pressure Differential Measuring	1.2.22	G													
			Instrument															
			Fungicidal Agents, (EPA)	1.2.12	G													
			Disinfectants or Biocide	1.2.10	G													
			Sanitizing Solutions															
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02 85 00.00 20	Daily Reports	1.4.3	G													
			SD-11 Closeout Submittals															
			Submittals at Completion of	1.4.4	G													
			Remediation Work															
		03 30 00	SD-01 Preconstruction Submittals															
			Concrete Curing Plan	1.6.3.1														
			Quality Control Plan	1.6.5	G													
			Quality Control Personnel	1.6.6	G													
			Certifications															
			Quality Control Organizational	1.6.6														
			Chart															
			Laboratory Accreditation	1.6.8	G													
			SD-02 Shop Drawings															
			Reinforcing Steel	1.6.2.1	G													
			SD-03 Product Data															
			Joint Sealants	2.4.8														
			Joint Filler	2.4.7														
			Cementitious Materials	2.4.1														
			Concrete Curing Materials	2.3.3														
			Reinforcement	2.5														
			Admixtures	2.4.5														
			Epoxy Grout	2.4.6														
			Epoxy Grout	3.4.10														
			SD-05 Design Data															
			Mix Design	2.3.1	G													
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		03 30 00	Concrete Mix Design	1.6.1.1	G													
			Fly Ash	1.6.4.1														
			Pozzolan	1.6.4.1														
			Ground Granulated Blast-Furnace	1.6.4.2														
			Slag															
			Aggregates	2.4.3														
			Compressive Strength Tests	3.12.2.3	G													
			Air Content	3.12.2.4														
			Slump Tests	3.12.2.1														
			Water	2.4.2														
			SD-07 Certificates															
			Reinforcing Bars	2.5.1														
			Material Safety Data Sheets	1.6.3.3														
			Field Testing Technician and	1.6.6.2														
			Testing Agency															
			SD-08 Manufacturer's Instructions															
			Curing Compound	2.3.3														
		05 12 00	SD-01 Preconstruction Submittals															
			Erection Drawings	1.3.1.1	G													
			SD-02 Shop Drawings															
			Fabrication drawings	1.3.2	G													
			SD-03 Product Data															
			Adhesive for Post-Installed	2.3.3														
			Anchor Rods															
			Welding electrodes and rods	2.4.1														
			Non-Shrink Grout	2.4.2														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		05 12 00	SD-06 Test Reports															
			Bolts, nuts, and washers	2.3														
			SD-07 Certificates															
			Steel	2.2														
			Bolts, nuts, and washers	2.3														
			Galvanizing	2.5														
			Welding procedures and	1.3.3.1														
			qualifications															
			Welding electrodes and rods	2.4.1														
		05 40 00	SD-02 Shop Drawings															
			Framing Components	1.5.1	G													
			SD-03 Product Data															
			studs, joists															
		05 50 13	SD-02 Shop Drawings															
			Access doors and panels	2.3	G													
			SD-03 Product Data															
			Access doors and panels	2.3														
		06 10 00	SD-02 Shop Drawings															
			Nailing Strips	2.2.1	G													
			SD-06 Test Reports															
			Preservative-treated	1.4.3														
			SD-07 Certificates															
			Certificates of grade	1.9.1														
			Preservative treatment	1.7														
		06 41 16.00 10	SD-02 Shop Drawings															
			Shop Drawings	1.4.2	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		06 41 16.00 10	Shop Drawings	2.8	G													
			Installation	3.1	G													
			SD-03 Product Data															
			Wood Materials	2.1	G													
			Wood Finishes		G													
			Finish Schedule	2.8.7.3	G													
			Certification															
			SD-04 Samples															
			Plastic Laminates	2.3	G													
			Cabinet Hardware	2.5	G													
			SD-07 Certificates															
			Quality Assurance	1.4														
			Laminate Clad Casework	3.1														
		06 61 16	SD-02 Shop Drawings															
			Detail Drawings	1.4.2	G													
			Installation	3.1	G													
			SD-03 Product Data															
			Solid polymer material	2.1														
			Qualifications	1.4.1														
			Fabrications	2.3														
			Certification	1.4.1														
			VOC Content															
			Engineered Quartz															
			SD-04 Samples															
			Material	2.1	G													
			Counter and Vanity Tops	2.3.6	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		06 61 16	SD-06 Test Reports															
			Solid polymer material	2.1														
			SD-07 Certificates															
			Fabrications	2.3														
			Qualifications	1.4.1														
			SD-10 Operation and Maintenance															
			Data															
			Clean-up	3.2														
		07 21 16	SD-03 Product Data															
			Blanket Insulation	2.2														
			Accessories	2.4														
			SD-08 Manufacturer’s Instructions															
			Insulation	3.3.1														
		07 42 63	SD-01 Preconstruction Submittals															
			Qualification of Manufacturer	1.5.3														
			Qualification of Installer	1.5.4														
			Qualifications for Welding Work	1.5.4.1														
			SD-02 Shop Drawings															
			Fabrication and Installation	1.5.1														
			drawings															
			Wall Panel Assemblies	1.5.1														
			Flashing and Accessories	1.5.1														
			Anchorage Systems	1.5.1														
			SD-03 Product Data															
			Manufacturer's catalog data	1.5.1														
			Factory Color Finish	1.5.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		07 42 63	Sub-girts and Formed Shapes	1.5.1														
			Closure Materials	1.5.1														
			Insulation	1.5.1														
			Pressure Sensitive Tape	1.5.1														
			Sealants and Caulking	2.4.4.1														
			Rated Wall Assembly	1.5.1														
			Galvanizing Repair Paint	1.5.1														
			Enamel Repair Paint															
			Accessories	1.5.1														
			SD-04 Samples															
			Wall Panel Assemblies	1.5.1														
			Fasteners	1.5.1														
			Metal Closure Strips	1.5.1														
			Insulation	1.5.1														
			manufacturer's color charts and	1.5.1														
			chips															
			SD-05 Design Data															
			wind design analysis	1.5.1														
			SD-06 Test Reports															
			Leakage Tests	3.7.2														
			wind load tests	1.3.2														
			Factory Color Finish	1.5.1														
			SD-07 Certificates															
			Fasteners	1.5.1														
			Galvanizing Repair Paint	1.5.1														
			Enamel Repair Paint															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		07 42 63	Qualification of Manufacturer	1.5.3														
			Qualification of Installer	1.5.4														
			wall system assembly wind load	1.5.1														
			and fire rating classification listings															
			SD-08 Manufacturer's Instructions															
			Installation of Wall panels	1.5.1														
			SD-11 Closeout Submittals															
			Warranty	1.8														
			Instructions	1.5.1														
			Material Safety Data Sheets	1.5.1														
			20 year 'No-Dollar-Limit' warranty	1.5.1														
		07 60 00	SD-02 Shop Drawings															
			Gutters	3.1.15	G													
			Downspouts	3.1.16	G													
			Expansion joints	3.1.20	G													
			Gravel stops and fascias	3.1.14	G													
			Splash pans	3.1.17	G													
			Base flashing	3.1.11	G													
			Counterflashing	3.1.12	G													
			Flashing at roof penetrations	3.1.21	G													
			Reglets	3.1.13	G													
			Copings		G													
			Drip edge		G													
			Eave flashing	3.1.18	G													
			SD-11 Closeout Submittals															
			Quality Control Plan	3.5														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		07 84 00	SD-06 Test Reports															
			Inspection	3.3														
			SD-07 Certificates															
			Inspector Qualifications	1.4.2														
			Firestopping Materials	2.1														
			Installer Qualifications	1.4.1														
		07 92 00	SD-03 Product Data															
			Sealants	2.1														
			Primers	2.2														
			Bond breakers	2.3														
			Backstops	2.4														
			SD-07 Certificates															
			Sealant	3.3.6														
		08 11 13	SD-02 Shop Drawings															
			Doors	2.1	G													
			Doors	2.1	G													
			Frames	2.6	G													
			Frames	2.6	G													
			Accessories	2.4														
			Weatherstripping	2.8														
			SD-03 Product Data															
			Doors	2.1	G													
			Frames	2.6	G													
			Accessories	2.4														
			Weatherstripping	2.8														
			SD-04 Samples															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		08 11 13	Factory-applied enamel finish		G													
			SD-06 Test Reports															
			Glazed door	1.4.1.1	G													
			Unglazed door	1.4.1.2	G													
		08 14 00	SD-02 Shop Drawings															
			Doors	2.1	G													
			SD-03 Product Data															
			Doors	2.1	G													
			Accessories	2.2														
			Water-resistant sealer	2.3.7														
			warranty	1.4														
			Sound transmission class rating	2.1.2	G													
			Fire resistance rating	2.1.3	G													
			SD-04 Samples															
			Doors	2.1														
			Door finish colors	2.3.6.2	G													
			SD-06 Test Reports															
			Cycle-slam	2.4														
			Hinge loading resistance	2.4														
		08 41 13	SD-01 Preconstruction Submittals															
			Sample Warranty	1.2.1	G													
			Listing of Product Installations	1.2.1	G													
			SD-02 Shop Drawings															
			Installation Drawings	1.2.1	G													
			SD-03 Product Data															
			Manufacturer's Catalog Data	1.2.1	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		08 41 13	SD-04 Samples															
			Finish and Color Samples	1.2.1	G													
			SD-05 Design Data															
			Blast Effects Design Analysis		G													
			SD-06 Test Reports															
			Certified Test Reports	1.2.1	G													
			Airblast	2.1.3.2	G													
			Airblast	2.1.4.1	G													
			Static Test Reports		G													
			SD-07 Certificates															
			Manufacturer's Product Warranty	3.4	G													
		08 44 00	SD-02 Shop Drawings															
			Glazed curtain wall system	1.5														
			Installation Drawings	1.12														
			Shop-Painting Aluminum	2.4.2														
			Shop-Painting Steel	2.4.3														
			SD-03 Product Data															
			Glazed curtain wall system	1.5														
			Preventive Maintenance and	1.13														
			Inspection															
			Metals For Fabrication	2.2														
			Nonskinning Sealing Compound	2.3														
			Metal Accessories	2.4.1														
			Curtain-wall Framing Members	2.5														
			Aluminum Doors and Frames															
			Curtain Wall Frame	2.6.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		08 44 00	Panels															
			Thermal Insulation Materials															
			Sealants and Caulkings	2.7														
			Curtain-Wall Installation Materials	2.8														
			Masonry Anchorage Devices	2.8.1														
			warranties	1.8.1														
			warranties	1.8.1														
			SD-05 Design Data															
			Calculations	1.3														
			Finish	2.4.5														
			Exposed-to-View Aluminum	2.4.5														
			Finish															
			Porcelain-Enamel															
			Seismic Calculations	1.5.6														
			Blast Effects Design Analysis		G													
			SD-06 Test Reports															
			Airblast	1.11.5.2	G													
			Static Test Reports		G													
			SD-08 Manufacturer's Instructions															
			Glazed curtain wall system	1.5														
			Insulating glass	1.4.1														
			Insulating glass	1.8														
			Insulating glass	1.11.5.3														
			Insulating glass	3.3.5.6														
			Insulating glass	3.3.5.7														
			SD-11 Closeout Submittals															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		08 44 00	WARRANTY	1.8														
		08 81 00	SD-02 Shop Drawings															
			Installation	3.1														
			SD-03 Product Data															
			Insulating Glass	1.5.1														
			Plastic Glazing															
			Glazing Accessories															
			Environmental Data															
			SD-04 Samples															
			Insulating Glass	1.5.1														
			Plastic Sheet															
			Glazing Compound	2.3.2														
			Tape	2.3.6														
			Sealant	2.3.3.1														
			SD-07 Certificates															
			Insulating Glass	1.5.1														
			Plastic Glazing															
			Glazing Accessories															
			SD-08 Manufacturer’s Instructions															
			Setting and sealing materials	2.3														
			Glass setting	3.2														
		08 91 00	SD-02 Shop Drawings															
			Wall louvers	1.4														
			Wall louvers	1.5														
			SD-03 Product Data															
			Metal Wall Louvers	2.2														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		08 91 00	SD-04 Samples															
			Wall louvers	1.4	G													
			Wall louvers	1.5	G													
			Door louvers	1.5	G													
		09 29 00	SD-03 Product Data															
			Cementitious backer units	2.1.3														
			Glass Mat Water-Resistant	2.1.2														
			Gypsum Tile Backing Board															
			Accessories	2.1.8														
			SD-07 Certificates															
			Asbestos Free Materials	2.1	G													
			SD-08 Manufacturer’s Instructions															
			Material Safety Data Sheets	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Manufacturer maintenance	2.1														
			instructions															
		09 30 13	SD-02 Shop Drawings															
			Detail Drawings	3.2	G													
			SD-03 Product Data															
			Tile	2.1	G													
			Tile	2.1	G													
			Setting-Bed	2.2	G													
			Mortar, Grout, and Adhesive	2.4	G													
			SD-04 Samples															
			Tile	2.1	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		09 30 13	Accessories	2.1	G													
			Transition Strips	2.1	G													
			Grout	2.4	G													
			SD-07 Certificates															
			Tile	2.1														
			Mortar, Grout, and Adhesive	2.4														
			SD-08 Manufacturer's Instructions															
			Maintenance Instructions	3.7														
			SD-10 Operation and Maintenance															
			Data															
			Installation	3.2	G													
		09 51 00	SD-02 Shop Drawings															
			Approved Detail Drawings	1.2														
			SD-03 Product Data															
			Acoustical Ceiling Systems	1.2.4														
			Certification															
			SD-04 Samples															
			Acoustical Units	2.1														
			Acoustic Ceiling Tiles	2.1.1														
			SD-06 Test Reports															
			Fire Resistive Ceilings															
			Ceiling Attenuation Class and	1.2.1														
			Test															
			SD-07 Certificates															
			Acoustical Units	2.1														
			Acoustic Ceiling Tiles	2.1.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		09 65 00	SD-02 Shop Drawings															
			Resilient Flooring and	2.9	G													
			Accessories															
			SD-03 Product Data															
			Resilient Flooring and	2.9	G													
			Accessories															
			Adhesives	2.5														
			Rubber Tile Flooring															
			Solid Vinyl Tile	2.2														
			Wall Base	2.3														
			SD-04 Samples															
			Resilient Flooring and	2.9	G													
			Accessories															
			SD-06 Test Reports															
			Moisture, Alkalinity and Bond	3.3	G													
			Tests															
			SD-08 Manufacturer’s Instructions															
			Surface Preparation	3.2	G													
			Installation	3.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Resilient Flooring and	2.9	G													
			Accessories															
		09 90 00	SD-02 Shop Drawings															
			Piping identification	3.10														
			stencil	3.10														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		09 90 00	SD-03 Product Data															
			Certification	1.3.2														
			Environmental Data	1.9.1														
			Materials	2.1														
			Coating	2.1	G													
			Manufacturer's Technical Data	2.1														
			Sheets															
			Sealant															
			SD-04 Samples															
			Color	1.11	G													
			SD-07 Certificates															
			Applicator's qualifications	1.3														
			Qualification Testing	1.4.1.2	G													
			SD-08 Manufacturer’s Instructions															
			Application instructions															
			Mixing	3.6.2														
			Manufacturer's Material Safety	1.7.2														
			Data Sheets															
			SD-10 Operation and Maintenance															
			Data															
			Coatings	2.1	G													
		10 14 00.20	SD-02 Shop Drawings															
			Detail Drawings	1.4.2	G													
			SD-03 Product Data															
			Installation	3.1	G													
			Warranty	1.6	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		10 14 00.20	SD-04 Samples															
			Interior Signage	1.4.1	G													
			Software		G													
			SD-10 Operation and Maintenance															
			Data															
			Approved Manufacturer's	3.1	G													
			Instructions															
			Protection and Cleaning	3.1.2	G													
		10 26 00	SD-02 Shop Drawings															
			Corner Guards	2.2	G													
			Wall Guards (Bumper Guards)	2.3	G													
			SD-03 Product Data															
			Corner Guards	2.2	G													
			Wall Guards (Bumper Guards)	2.3	G													
			SD-04 Samples															
			Finish	2.5	G													
			SD-06 Test Reports															
			Corner Guards	2.2														
			Wall Guards (Bumper Guards)	2.3														
			SD-07 Certificates															
			Corner Guards	2.2														
			Wall Guards (Bumper Guards)	2.3														
		12 48 13	SD-02 Shop Drawings															
			Installation Drawings	3.2	G													
			Detail Drawings	3.2	G													
			SD-03 Product Data															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		12 48 13	Entrance Floor Mats and Frames	2.1	G													
			SD-04 Samples															
			Entrance Floor Mats and Frames	2.1	G													
			SD-08 Manufacturer's Instructions															
			Manufacturer's Instructions	3.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Protection, Maintenance, and	3.2	G													
			Repair Information															
		21 13 13.00 20	SD-02 Shop Drawings															
			Shop Drawings	1.5.2	G													
			SD-03 Product Data															
			Pipe	2.1.1	G													
			Fittings	2.1.1	G													
			Valves	2.1.5	G													
			Sprinklers	2.1.4	G													
			Pipe hangers and supports	2.1.6	G													
			Sprinkler Alarm Switches	2.2.1	G													
			Mechanical couplings	2.1.1	G													
			Backflow Prevention Assembly	2.1.7	G													
			SD-05 Design Data															
			Hydraulic Calculations	1.3	G													
			SD-06 Test Reports															
			Request to schedule Preliminary	3.5	G													
			Tests															
			Preliminary Test Report	3.5	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		21 13 13.00 20	Request to schedule Final	3.6	G													
			Acceptance Test															
			Final Acceptance Test Report		G													
			SD-07 Certificates															
			Inspection by Sprinkler System	3.1	G													
			Designer															
			Sprinkler System Designer	1.5.1														
			Sprinkler System Installer	1.5.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Operating and Maintenance	3.7	G													
			Instructions															
			SD-11 Closeout Submittals															
			As-built drawings	1.5.2	G													
			On-site training	3.7	G													
		22 00 00	SD-02 Shop Drawings															
			Plumbing System	3.6.1	G													
			SD-03 Product Data															
			Fixtures	2.5														
			Flush Tank Water Closets	2.5.1														
			Countertop Lavatories	2.1.1														
			Kitchen Sinks	2.5.4														
			Service Sinks	2.5.5														
			Drinking-Water Coolers		G													
			Shower Base															
			Pumps		G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		22 00 00	Shower Faucets	2.5.7	G													
			Welding	3.1.6.2														
			Plumbing System	3.6.1														
			SD-06 Test Reports															
			Tests, Flushing and Disinfection	3.6														
			SD-07 Certificates															
			Materials and Equipment	1.3														
			Bolts	2.2.1														
			SD-10 Operation and Maintenance															
			Data															
			Plumbing System	3.6.1	G													
		23 00 00	SD-02 Shop Drawings															
			Detail Drawings	1.4.5	G													
			SD-03 Product Data															
			Metallic Flexible Duct	2.9.1.1														
			Insulated Nonmetallic Flexible	2.9.1.2														
			Duct Runouts															
			Duct Connectors	2.9.1.2														
			Duct Access Doors	2.9.2	G													
			Fire Dampers	2.9.3	G													
			Manual Balancing Dampers	2.9.4	G													
			Diffusers	2.9.7.1														
			Registers															
			Louvers	2.9.8														
			Residential Kitchen Exhaust															
			Hood															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 00 00	Sidewall Vent															
			SD-06 Test Reports															
			Performance Tests	1.4.6	G													
			Damper Acceptance Test	3.11	G													
			SD-07 Certificates															
			Bolts	1.4.1														
			Certification	1.4.1														
			Ozone Depleting Substances	1.4.3														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Installation	3.3														
			Instructions															
			Operation and Maintenance	3.14.2														
			Training															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.14.1	G													
			Manuals															
			Fire Dampers	2.9.3	G													
			Manual Balancing Dampers	2.9.4	G													
			Residential Kitchen Exhaust															
			Hood															
		23 05 93	SD-01 Preconstruction Submittals															
			Records of Existing Conditions		G													
			Independent TAB Agency and	1.5.1	G													
			Personnel Qualifications															
			TAB Design Review Report		G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 05 93	TAB Firm	1.5.1.1	G													
			SD-02 Shop Drawings															
			TAB Schematic Drawings and	1.3.3	G													
			Report Forms															
			SD-03 Product Data															
			Equipment and Performance	1.3	G													
			Data															
			TAB Related HVAC Submittals	1.5.1.3	G													
			TAB Verification		G													
			SD-06 Test Reports															
			Completed Pre-Final DALT	3.2.5	G													
			Report															
			Certified Final DALT Report	3.2.8	G													
			Proportional Balancing		G													
			Prerequisite HVAC Work		G													
			Checkout List															
			Completed Pre-Final TAB Report		G													
			TAB Design Review Report		G													
			SD-07 Certificates															
			Independent TAB Agency and	1.5.1	G													
			Personnel Qualifications															
			DALT and TAB Submittal and	1.5.3.1	G													
			Work Schedule															
			TAB Pre-Field Engineering		G													
			Report															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		23 05 93	Instrument Calibration	1.5.5	G													
			Certificates															
			DALT and TAB Procedures	3.6	G													
			Summary															
			Completed Pre-Final DALT Work	3.6	G													
			Checklist															
			Advance Notice of Pre-Final	3.2.2	G													
			DALT Field Work															
			TAB Firm	1.5.1.1	G													
			Prerequisite HVAC Work Check		G													
			Out List For Season 2															
		23 07 00	SD-02 Shop Drawings															
			Pipe Insulation Systems	2.3	G													
			Pipe Insulation Systems	3.2	G													
			Duct Insulation Systems	3.3	G													
			SD-03 Product Data															
			Pipe Insulation Systems	2.3	G													
			Pipe Insulation Systems	3.2	G													
			Duct Insulation Systems	3.3	G													
			Equipment Insulation Systems		G													
			SD-08 Manufacturer's Instructions															
			Pipe Insulation Systems	2.3														
			Pipe Insulation Systems	3.2														
			Duct Insulation Systems	3.3														
		23 09 23.13 20	SD-02 Shop Drawings															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		23 09 23.13 20	Control System Drawings Title	1.4.1.1														
			Sheet															
			List of I/O Points	1.4.1.2														
			Control System Components List	1.4.1.3														
			Control System Schematics	1.4.1.4	G													
			Component Wiring Diagrams	1.4.1.5														
			Terminal Strip Diagrams	1.4.1.6														
			SD-03 Product Data															
			Direct Digital Controllers	2.1.1	G													
			Sensors and Input Hardware	2.2														
			Output Hardware	2.3														
			Surge and Transient Protection	2.4.2														
			SD-05 Design Data															
			Performance Verification Testing	3.4.2														
			Plan															
			Pre-Performance Verification	3.4.4														
			Testing Checklist															
			SD-06 Test Reports															
			Performance Verification Testing	3.4.9														
			Report															
			SD-07 Certificates															
			Contractor's Qualifications	1.6.6	G													
			SD-09 Manufacturer's Field															
			Reports															
			Pre-PVT Checklist	3.4.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					REMARKS
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		23 09 23.13 20	SD-10 Operation and Maintenance															
			Data															
			BACnet Direct Digital Control	1.4														
			Systems															
			SD-11 Closeout Submittals															
			Training Documentation	3.5.1														
		23 64 26	SD-03 Product Data															
			Automatic Balancing Valves	2.4.4	G													
			Calibrated Balancing Valves		G													
			Pressure Relief Valve	2.4.6														
			Pumps	2.6	G													
			Combination Strainer and Pump	2.5.2	G													
			Suction Diffuser															
			SD-06 Test Reports															
			Piping Welds NDE Report	3.1.1.3														
			Pressure Tests Reports	3.4.2														
			SD-07 Certificates															
			Employer's Record Documents	3.1.1.1														
			(For Welding)															
			Welding Procedures and	3.1.1.2														
			Qualifications															
			Fittings	1.7.2														
			Unions	2.3.2														
			Flanges	2.2.2.2														
			Gaskets	2.2.2.2														
			SD-08 Manufacturer’s Instructions															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		23 64 26	Lesson plan for the Instruction		G													
			Course															
			SD-10 Operation and Maintenance															
			Data															
			Automatic Balancing Valves	2.4.4	G													
			Calibrated Balancing Valves		G													
			Pressure Relief Valve	2.4.6														
			Pumps	2.6	G													
			Combination Strainer and Pump	2.5.2	G													
			Suction Diffuser															
		23 81 00.00 20	SD-02 Shop Drawings															
			Field-Assembled Refrigerant															
			Piping															
			Control System Wiring Diagrams	1.4.2														
			SD-03 Product Data															
			Packaged Terminal Units	2.2	G													
			Ductless Dedicated Outdoor		G													
			Split/System	2.4.1	G													
			Split/System	3.1.3	G													
			Filters	2.5														
			Thermostats															
			Refrigerant	1.5														
			Refrigerant Piping and															
			Accessories															
			Coatings for Finned Tube Coils	2.6														
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 81 00.00 20	Salt-Spray Tests	2.11.1														
			Start-Up and Initial Operational	3.8.3														
			Tests															
			SD-08 Manufacturer's Instructions															
			Packaged Terminal Units	2.2														
			Dedicated Outdoor	2.3														
			Dedicated Outdoor	2.5														
			Ductless Split/System															
			Filters	2.5														
			Thermostats															
			Refrigerant Piping and															
			Accessories															
			SD-10 Operation and Maintenance															
			Data															
			Packaged Terminal Units	2.2														
			Dedicated Outdoor	2.3														
			Dedicated Outdoor	2.5														
			Ductless Split/System															
			Filters	2.5														
			SD-11 Closeout Submittals															
			Posted Operating Instructions	1.4.4														
		23 82 00.00 20	SD-03 Product Data															
			Unit Heaters	2.1	G													
			Cabinet Unit Heaters	2.1	G													
			SD-10 Operation and Maintenance															
			Data															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		23 82 00.00 20	Unit Heaters	2.1														
			Cabinet Unit Heaters; Data															
			Package 2															
		26 20 00	SD-02 Shop Drawings															
			Panelboards	2.13	G													
			Cable trays	2.4	G													
			SD-03 Product Data															
			Receptacles	2.12	G													
			Circuit breakers	2.13.3	G													
			Switches	2.10	G													
			Enclosed circuit breakers	2.14	G													
			CATV outlets	2.22.1	G													
			Grounding Busbar	2.23.3	G													
			Surge protective devices	2.29	G													
			SD-06 Test Reports															
			600-volt wiring test	3.5.2	G													
			Grounding system test	3.5.5	G													
			Ground-fault receptacle test	3.5.4	G													
			SD-07 Certificates															
			Fuses	2.11	G													
			SD-09 Manufacturer's Field															
			Reports															
			Transformer factory tests															
			SD-10 Operation and Maintenance															
			Data															
			Electrical Systems		G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 29 23	SD-02 Shop Drawings															
			Schematic diagrams	1.5.1	G													
			Interconnecting diagrams	1.5.2	G													
			Installation drawings	1.5.3	G													
			SD-03 Product Data															
			Variable frequency drives	2.1	G													
			Wires and cables	2.3														
			Equipment schedule	1.5.4														
			SD-06 Test Reports															
			VFD Test	3.2.1														
			Performance Verification Tests	3.2.2														
			Endurance Test	3.2.3														
			SD-08 Manufacturer's Instructions															
			Installation instructions	1.5.5														
			SD-09 Manufacturer's Field															
			Reports															
			VFD Factory Test Plan	2.5.1	G													
			Factory test results	1.5.6														
			SD-10 Operation and Maintenance															
			Data															
			Variable frequency drives	2.1														
		26 41 00	SD-02 Shop Drawings															
			Overall lightning protection	1.4.1.1	G													
			system															
			Each major component	1.4.1.2	G													
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		26 41 00	Lightning Protection and	1.4.3	G													
			Grounding System Test Plan															
			Lightning Protection and	3.4.1	G													
			Grounding System Test															
			SD-07 Certificates															
			Lightning Protection System	1.2.3	G													
			Installers Documentation															
			Component UL Listed and	1.4.2	G													
			Labeled															
			Lightning protection system	1.4.4	G													
			inspection certificate															
			Roof manufacturer's warranty	3.1.1	G													
		26 51 00.00 22	SD-03 Product Data															
			Fluorescent lighting fixtures	2.1	G													
			Fluorescent electronic ballasts	1.6.4	G													
			LED Luminaires	2.2	G													
			Dimmer switch		G													
			Photocell	2.6	G													
			Exit signs	2.7	G													
			Emergency lighting equipment		G													
			Occupancy sensors	2.8	G													
			Electronic dimming ballast	2.1.2	G													
			Dimming ballast controls	2.1.3	G													
			Environmental Data															
			Energy Efficiency															
			SD-06 Test Reports															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 51 00.00 22	LED Luminaire - IES LM-79 Test	1.6.2	G													
			Report															
			LED Light Source - IES LM-80	1.6.3	G													
			Test Report															
			Operating test	3.3														
			Operational Service															
		27 10 00	SD-02 Shop Drawings															
			Telecommunications drawings	1.6.1.1	G													
			Telecommunications Space	1.6.1.2	G													
			Drawings															
			SD-03 Product Data															
			Telecommunications cabling	2.3	G													
			Patch panels	2.4.5	G													
			Telecommunications	2.5	G													
			outlet/connector assemblies															
			Equipment support frame	2.4.2	G													
			Connector blocks	2.4.3	G													
			SD-06 Test Reports															
			Telecommunications cabling	3.5.1	G													
			testing															
			SD-07 Certificates															
			Telecommunications Contractor	1.6.2.1	G													
			Key Personnel	1.6.2.2	G													
			Manufacturer Qualifications	1.6.2.3	G													
			Test plan	1.6.3	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		27 10 00	SD-09 Manufacturer's Field															
			Reports															
			Factory reel tests	2.10.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Telecommunications cabling and	1.10.1	G													
			pathway system															
			SD-11 Closeout Submittals															
			Record Documentation	1.10.2	G													
		28 23 23.00 10	SD-01 Preconstruction Submittals															
			Report Documenting Changes to	1.4.2														
			the Site															
			Site Survey Report	3.1.1	G													
			SD-02 Shop Drawings															
			As-built Drawings	1.3.2	G													
			SD-03 Product Data															
			Training Documentation	1.4.3.2	G													
			SD-06 Test Reports															
			Test Procedures and Reports	1.3.1														
			Original Copies of all Test Data	3.5.1	G													
			Report Describing All Results	3.5.2	G													
			SD-07 Certificates															
			Supplemental Quality Control	3.3														
			Letter of Certification															
			SD-08 Manufacturer's Instructions															
			Group V Technical Data Package	1.4.4														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		28 23 23.00 10	SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	1.4.3.1														
			Manuals															
			Operator's Training Report	3.4.2														
			SD-11 Closeout Submittals															
			Data Entry	1.4.3.3	G													
		28 31 63.00 20	SD-02 Shop Drawings															
			Battery power calculations	1.5.1	G													
			SD-03 Product Data															
			Fire alarm control panel (FACP)	2.1.12	G													
			Terminal cabinets	2.1.11.2	G													
			Manual stations	2.1.15	G													
			Transmitters	2.1.17	G													
			Batteries	2.1.10.1	G													
			Battery chargers	2.1.10.3	G													
			Smoke sensors	2.1.7	G													
			Carbon monoxide detectors	2.1.8	G													
			Carbon monoxide detectors	2.1.8	G													
			Wiring	2.1.11.3	G													
			Wiring	2.3	G													
			Notification appliances	2.1.16	G													
			Addressable input modules	2.1.5	G													
			Addressable output modules	2.1.6	G													
			Amplifiers	2.1.14	G													
			Tone generators	2.1.14	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

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		28 31 63.00 20	Digitalized voice generators	2.1.14	G													
			Notification appliance circuit	2.1.13	G													
			power supply panels															
			Smoke sensor testing procedures	2.1.7.3	G													
			Radio transmitter and interface	2.1.17.1	G													
			panels															
			SD-07 Certificates															
			Qualifications of installer	1.5.2	G													
			SD-10 Operation and Maintenance															
			Data															
			INTERIOR FIRE ALARM	2.1	G													
			SYSTEM															
			Record drawing software	1.5.3	G													
		31 11 00	SD-03 Product Data															
			Nonsaleable Materials	3.5.1	G													
			SD-04 Samples															
			Tree Wound Paint	2.1														
			Herbicide															
		32 16 13	SD-03 Product Data															
			Concrete	2.1														
			SD-06 Test Reports															
			Field Quality Control	3.6														
		32 17 24.00 10	SD-03 Product Data															
			Equipment	1.2	G													
			Composition Requirements															
			Qualifications	1.4.1														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

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		32 17 24.00 10	SD-06 Test Reports															
			Sampling and Testing	2.3														
			SD-07 Certificates															
			Volatile Organic Compound	2.2.1														
			(VOC)															
		32 93 00	SD-01 Preconstruction Submittals															
			State Landscape Contractor's	1.3.3														
			License															
			Time Restrictions and Planting	1.5														
			Conditions															
			SD-03 Product Data															
			Local/Regional Materials															
			Peat	2.3.5														
			Composted Derivatives	2.3.8														
			Rotted Manure	2.3.11														
			Organic Mulch Materials	2.6.1														
			Gypsum	2.3.9														
			Drainage Pipe															
			Mulch	2.6	G													
			Ground Stakes	3.5.11.2														
			Ground Stakes	3.5.11.2														
			Hose	2.7.3														
			Fertilizer	2.5														
			Weed control fabric	1.4.2.4	G													
			Staking Material	2.7.1														
			Metal anchors	2.7.7														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
NGIS B678

CONTRACTOR

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		32 93 00	Antidesiccants	2.8														
			Erosion control materials	2.9														
			Photographs	1.3.4	G													
			SD-04 Samples															
			Mulch	2.6	G													
			SD-06 Test Reports															
			Topsoil composition tests	1.3.1														
			Topsoil composition tests	2.2.4														
			SD-07 Certificates															
			Forest Stewardship Council															
			(FSC) Certification															
			Nursery certifications	1.3.2														
			Nursery certifications	2.1.1														
			SD-10 Operation and Maintenance															
			Data															
			Plastic Identification															

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.34	(2001; R 2012) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE A10.44	(2014) Control of Energy Sources (Lockout/Tagout) for Construction and Demolition Operations
ASSE/SAFE Z244.1	(2003; R 2014) Control of Hazardous Energy Lockout/Tagout and Alternative Methods
ASSE/SAFE Z359.0	(2012) Definitions and Nomenclature Used for Fall Protection and Fall Arrest
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
ASSE/SAFE Z359.11	(2014) Safety Requirements for Full Body Harnesses
ASSE/SAFE Z359.12	(2009) Connecting Components for Personal Fall Arrest Systems
ASSE/SAFE Z359.13	(2013) Personal Energy Absorbers and Energy Absorbing Lanyards
ASSE/SAFE Z359.14	(2014) Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems
ASSE/SAFE Z359.15	(2014) Safety Requirements for Single Anchor Lifelines and Fall Arresters for Personal Fall Arrest Systems
ASSE/SAFE Z359.2	(2007) Minimum Requirements for a Comprehensive Managed Fall Protection Program
ASSE/SAFE Z359.3	(2007) Safety Requirements for Positioning and Travel Restraint Systems
ASSE/SAFE Z359.4	(2013) Safety Requirements for Assisted-Rescue and Self-Rescue Systems,

	Subsystems and Components
ASSE/SAFE Z359.6	(2009) Specifications and Design Requirements for Active Fall Protection Systems
ASSE/SAFE Z359.7	(2011) Qualification and Verification Testing of Fall Protection Products

ASME INTERNATIONAL (ASME)

ASME B30.20	(2013; INT Oct 2010 - May 2012) Below-the-Hook Lifting Devices
ASME B30.22	(2010) Articulating Boom Cranes
ASME B30.26	(2015; INT Jun 2010 - Jun 2014) Rigging Hardware
ASME B30.3	(2012) Tower Cranes
ASME B30.5	(2014) Mobile and Locomotive Cranes
ASME B30.8	(2010) Floating Cranes and Floating Derricks
ASME B30.9	(2014; INT Feb 2011 - Nov 2013) Slings

ASTM INTERNATIONAL (ASTM)

ASTM F855	(2015) Standard Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1048	(2003) Guide for Protective Grounding of Power Lines
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013; INT 8-10 2014; INT 11 2015) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2013) Standard for Portable Fire Extinguishers
NFPA 241	(2013; Errata 2015) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 51B	(2014) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National

	Electrical Code
NFPA 70E	(2015; ERTA 1 2015) Standard for Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1910.333	Selection and Use of Work Practices
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1915.89	Control of Hazardous Energy (Lockout/Tags-Plus)
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.1400	Cranes and Derricks in Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.450	Scaffolds
29 CFR 1926.500	Fall Protection
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

1.2 DEFINITIONS

1.2.1 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authorization to take prompt corrective measures with regards to such hazards.

1.2.2 Competent Person, Confined Space

The CP, Confined Space, is a person meeting the competent person requirements as defined EM 385-1-1 Appendix Q, with thorough knowledge of OSHA’s Confined Space Standard, 29 CFR 1910.146, and designated in writing to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.3 Competent Person, Cranes and Rigging

The CP, Cranes and Rigging, as defined in EM 385-1-1 Appendix Q, is a person meeting the competent person, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.4 Competent Person, Excavation/Trenching

A CP, Excavation/Trenching, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and 29 CFR 1926, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.5 Competent Person, Fall Protection

The CP, Fall Protection, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and in accordance with ASSE/SAFE Z359.0, who has been designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.6 Competent Person, Scaffolding

The CP, Scaffolding is a person meeting the competent person requirements in EM 385-1-1 Appendix Q, and designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge and experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and also has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented and include experience on the specific scaffolding systems/types being used, assessment of the base material that the scaffold will be erected upon, load calculations for materials and personnel, and erection and dismantling. The CP for scaffolding must have a documented, minimum of 8-hours of scaffold training to include training

on the specific type of scaffold being used (e.g. mast-climbing, adjustable, tubular frame), in accordance with EM 385-1-1 Section 22.B.02.

1.2.7 Competent Person (CP) Trainer

A competent person trainer as defined in EM 385-1-1 Appendix Q, who is qualified in the material presented, and who possesses a working knowledge of applicable technical regulations, standards, equipment and systems related to the subject matter on which they are training Competent Persons. A competent person trainer must be familiar with the typical hazards and the equipment used in the industry they are instructing. The training provided by the competent person trainer must be appropriate to that specific industry. The competent person trainer must evaluate the knowledge and skills of the competent persons as part of the training process.

1.2.8 High Risk Activities

High Risk Activities are activities that involve work at heights, crane and rigging, excavations and trenching, scaffolding, electrical work, and confined space entry.

1.2.9 High Visibility Accident

A High Visibility Accident is any mishap which may generate publicity or high visibility.

1.2.10 Load Handling Equipment (LHE)

LHE is a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including crane, derricks, hoists and power operated equipment used with rigging to raise, lower or horizontally move a load).

1.2.11 Medical Treatment

Medical Treatment is treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

1.2.12 Near Miss

A Near Miss is a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred (e.g., a worker falls off a scaffold and is not injured; a crane swings around to move the load and narrowly misses a parked vehicle).

1.2.13 Operating Envelope

The Operating Envelope is the area surrounding any crane or load handling equipment. Inside this "envelope" is the crane, the operator, riggers and crane walkers, other personnel involved in the operation, rigging gear between the hook, the load, the crane's supporting structure (i.e. ground or rail), the load's rigging path, the lift and rigging procedure.

1.2.14 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a

recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

1.2.15 Qualified Person, Fall Protection (QP for FP)

A QP for FP is a person meeting the requirements of EM 385-1-1 Appendix Q, and ASSE/SAFE Z359.0, with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, and evaluating and specifying fall protection and rescue systems.

1.2.16 Recordable Injuries or Illnesses

Recordable Injuries or Illnesses are any work-related injury or illness that results in:

a. Death, regardless of the time between the injury and death, or the length of the illness;

b. Days away from work (any time lost after day of injury/illness onset);

c. Restricted work;

d. Transfer to another job;

e. Medical treatment beyond first aid;

f. Loss of consciousness; or

g. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (a) through (f) above.

1.2.17 USACE Property and Equipment

Interpret "USACE" property and equipment specified in USACE EM 385-1-1 as Government property and equipment.

1.2.18 Load Handling Equipment (LHE) Accident or Load Handling Equipment Mishap

A LHE accident occurs when any one or more of the eight elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; or collision, including unplanned contact between the load, crane, or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents, even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, or roll over). Document any mishap that meets the criteria described in the Contractor Significant Incident Report (CSIR) using the NAVFAC prescribed Navy Crane Center (NCC) form using the Crane High Hazard working group mishap reporting form.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

SD-06 Test Reports

Monthly Exposure Reports

Notifications and Reports

Accident Reports; G

LHE Inspection Reports

SD-07 Certificates

Contractor Safety Self-Evaluation Checklist

Crane Operators/Riggers

Standard Lift Plan; G

Naval Architecture Analysis; G

Activity Hazard Analysis (AHA)

Confined Space Entry Permit

Hot Work Permit

Certificate of Compliance

Third Party Certification of Barge-Mounted Mobile Cranes

License Certificates

Radiography Operation Planning Work Sheet; G

Machinery & Mechanized Equipment Certification Form

1.4 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report and attach to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both Prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the voucher.

1.5 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. Complete

the checklist monthly and submit with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90 may result in retention of up to 10 percent of the voucher.

1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.6.1 Subcontractor Safety Requirements

For this contract, neither Contractor nor any subcontractor may enter into contract with any subcontractor that fails to meet the following requirements. The term subcontractor in this and the following paragraphs means any entity holding a contract with the Contractor or with a subcontractor at any tier.

1.6.1.1 Experience Modification Rate (EMR)

Subcontractors on this contract must have an effective EMR less than or equal to 1.10, as computed by the National Council on Compensation Insurance (NCCI) or if not available, as computed by the state agency's rating bureau in the state where the subcontractor is registered, when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable EMR range cannot be achieved. Relaxation of the EMR range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's Site Safety and Health Officer (SSHO) must collect and maintain the certified EMR ratings for all subcontractors on the project and make them available to the Government at the Government's request.

1.6.1.2 OSHA Days Away from Work, Restricted Duty, or Job Transfer (DART) Rate

Subcontractors on this contract must have a DART rate, calculated from the most recent, complete calendar year, less than or equal to 3.4 when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The OSHA Dart Rate is calculated using the following formula:

(N/EH) x 200,000

where:

N = number of injuries and illnesses with days away, restricted work, or job transfer

EH = total hours worked by all employees during most recent, complete calendar year

200,000 = base for 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year)

The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable OSHA Dart rate range cannot be achieved for a particular subcontractor. Relaxation of the OSHA DART rate range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's Site Safety and Health Officer (SSHO) must collect and maintain self-certified OSHA DART rates for all subcontractors on the project and make them available to the Government at the Government's request.

1.7 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.7.1 Personnel Qualifications

1.7.1.1 Site Safety and Health Officer (SSHO)

Provide an SSHO that meets the requirements of EM 385-1-1 Section 1. The SSHO must ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one (1) person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Alternate SSHO must be at the work site at all times to implement and administer the Contractor's safety program and government-accepted Accident Prevention Plan. The SSHO and Alternate SSHO must have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs.

If the SSHO is off-site for a period longer than 24 hours, an equally-qualified alternate SSHO must be provided and must fulfill the same roles and responsibilities as the primary SSHO. When the SSHO is temporarily (up to 24 hours) off-site, a Designated Representative (DR), as identified in the AHA may be used in lieu of an Alternate SSHO, and must be on the project site at all times when work is being performed. Note that the DR is a collateral duty safety position, with safety duties in addition to their full time occupation.

1.7.1.2 Contractor Quality Control (QC) Manager:

The Contractor Quality Control Manager can be the SSHO on this project.

1.7.1.3 Competent Person Qualifications

Provide Competent Persons in accordance with EM 385-1-1, Appendix Q and herein. Competent Persons for high risk activities include confined space, cranes and rigging, excavation/trenching, fall protection, and electrical work. The CP for these activities must be designated in writing, and meet the requirements for the specific activity (i.e. competent person, fall protection).

The Competent Person identified in the Contractor's Safety and Health Program and accepted Accident Prevention Plan, must be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Provide the credentials of the Competent Persons(s) to the the Contracting Officer for information in consultation with the Safety Office.

1.7.1.3.1 Competent Person for Confined Space Entry

Provide a Confined Space (CP) Competent Person who meets the requirements of EM 385-1-1, Appendix Q, and herein. The CP for Confined Space Entry must supervise the entry into each confined space.

1.7.1.3.2 Competent Person for Scaffolding

Provide a Competent Person for Scaffolding who meets the requirements of EM 385-1-1, Section 22.B.02 and herein.

1.7.1.3.3 Competent Person for Fall Protection

Provide a Competent Person for Fall Protection who meets the requirements of EM 385-1-1, Section 21.C.04 and herein.

1.7.1.4 Qualified Trainer Requirements

Individuals qualified to instruct the 40 hour contract safety awareness course, or portions thereof, must meet the definition of a Competent Person Trainer, and, at a minimum, possess a working knowledge of the following subject areas: EM 385-1-1, Electrical Standards,Lockout/Tagout, Fall Protection, Confined Space Entry for Construction; Excavation, Trenching and Soil Mechanics, and Scaffolds in accordance with 29 CFR 1926.450, Subpart L.

Instructors are required to:

a. Prepare class presentations that cover construction-related safety requirements and includes topics covered in the NAVFAC Construction Safety Hazard Awareness Course for Contractors.

b. Ensure that all attendees attend all sessions by using a class roster signed daily by each attendee. Maintain copies of the roster for at least five (5) years. This is a certification class and must be attended 100 percent. In cases of emergency where an attendee cannot make it to a session, the attendee can make it up in another class session for the same subject.

c. Update training course materials whenever an update of the EM 385-1-1 becomes available.

d. Provide a written exam of at least 50 questions. Students are required to answer 80 percent correctly to pass.

e. Request, review and incorporate student feedback into a continuous course improvement program.

1.7.1.5 Crane Operators/Riggers

Provide Operators meeting the requirements in EM 385-1-1, Section 15.B for Riggers and Section 16.B for Crane Operators. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, designate crane operators qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Provide proof of current qualification.

1.7.2 Personnel Duties

1.7.2.1 Duties of the Site Safety and Health Officer (SSHO)

The SSHO must:

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily production report.

b. Conduct mishap investigations and complete required accident reports. Report mishaps and near misses.

c. Use OSHA's Form 300 to log work-related injuries and illnesses occurring on the project site for Prime Contractors and subcontractors. Post and maintain the Form 300 on the site Safety Bulletin Board.

d. Maintain applicable safety reference material on the job site.

e. Attend the pre-construction conference, pre-work meetings including preparatory meetings, and periodic in-progress meetings.

f. Review the APP and AHAs for compliance with EM 385-1-1, and approve, sign, implement and enforce them.

g. Establish a Safety and Occupational Health (SOH) Deficiency Tracking System that lists and monitors outstanding deficiencies until resolution.

h. Ensure subcontractor compliance with safety and health requirements.

i. Maintain a list of hazardous chemicals on site and their material Safety Data Sheets (SDS).

j. Maintain a weekly list of high hazard activities involving energy, equipment, excavation, entry into confined space, and elevation, and be prepared to discuss details during QC Meetings.

k. Provide and keep a record of site safety orientation and indoctrination for Contractor employees, subcontractor employees, and site visitors.

Superintendent, QC Manager, and SSHO are subject to dismissal if the above duties are not being effectively carried out. If Superintendent, QC Manager, or SSHO are dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out.

1.7.3 Meetings

1.7.3.1 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction conference. This includes the project superintendent, Site Safety and Occupational Health officer, quality control manager,

or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays.

c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin work until an APP is established that is acceptable to the Contracting Officer.

1.7.3.2 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors on the project location. The SSHO, supervisors, foremen, or CDSOs must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

1.8 ACCIDENT PREVENTION PLAN (APP)

A qualified person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, Appendix A, and as supplemented herein. Cover all paragraph and subparagraph elements in EM 385-1-1, Appendix A. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and monitor safe work practices of subcontractors. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP must be signed by an officer of the firm (Prime Contractor senior person), the individual preparing the APP, the on-site superintendent, the designated SSHO, the Contractor Quality Control Manager, and any designated Certified Safety Professional (CSP) or Certified Health Physicist (CIH). The SSHO must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read

and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once reviewed and accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered. Should any severe hazard exposure (i.e. imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate and remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34), and the environment.

1.8.1 Names and Qualifications

Provide plans in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

a. Names and qualifications (resumes including education, training, experience and certifications) of site safety and health personnel designated to perform work on this project to include the designated Site Safety and Health Officer and other competent and qualified personnel to be used. Specify the duties of each position.

b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; and personal protective equipment and clothing to include selection, use and maintenance.

1.8.2 Plans

Provide plans in the APP in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

1.8.2.1 Confined Space Entry Plan

Develop a confined or enclosed space entry plan in accordance with EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive CPL 2.100, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work

exists and none will be created.)

1.8.2.2 Standard Lift Plan (SLP)

Plan lifts to avoid situations where the operator cannot maintain safe control of the lift. Prepare a written SLP in accordance with EM 385-1-1, Section 16.A.03, using Form 16-2 for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP must be developed, reviewed and accepted by all personnel involved in the lift in conjunction with the associated AHA. Signature on the AHA constitutes acceptance of the plan. Maintain the SLP on the LHE for the current lift(s) being made. Maintain historical SLPs for a minimum of 3 months.

1.8.2.3 Critical Lift Plan - Crane or Load Handling Equipment

Provide a Critical Lift Plan as required by EM 385-1-1, Section 16.H.01, using Form 16-3. Critical lifts require detailed planning and additional or unusual safety precautions. Develop and submit a critical lift plan to the Contracting Officer 30 calendar days prior to critical lift. Comply with load testing requirements in accordance with EM 385-1-1, Section 16.F.03.

In addition to the requirements of EM 385-1-1, Section 16.H.02, the critical lift plan must include the following:

a. For lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.1400 and EM 385-1-1, Section 16.T.

b. For barge mounted mobile cranes, provide a Naval Architecture Analysis and include an LHE Manufacturer's Floating Service Load Chart in accordance with the criteria from the selected standard in EM 385-1-1, Section 16.L.02. The Floating Service Load Chart must provide a table of rated load versus boom angle and radius. The Floating Service Load Chart must also provide the maximum allowable machine list and trim associated with the tabular loads and radii provided. If the Manufacturer's Floating Service Load Chart is not available, a floating service load chart may be developed and provided by a qualified Registered Professional Engineer (RPE), competent in the field of floating cranes. The Load Chart must be in accordance with the criteria from the selected standard in EM 385-1-1, Section 16.L; provide a table of rated load versus boom angle and radius; provide the maximum allowable machine list and machine trim associated with the tabular loads and radii provided; and be stamped by a RPE qualified and competent in the field of floating cranes. The RPE, competent in the field of floating cranes must stamp and certify (sign) that the Naval Architectural Analysis (NAA) meets the requirements of EM 385-1-1, Section 16.L.03.

c. Multi-purpose machines, material handling equipment, and construction equipment used to lift loads that are suspended by rigging gear, require proof of authorization from the machine OEM that the machine is capable of making lifts of loads suspended by rigging equipment. Demonstrate that the operator is properly trained and that the equipment is properly configured to make such lifts and is equipped with a load chart.

1.8.2.4 Fall Protection and Prevention (FP&P) Plan

The plan must comply with the requirements of EM 385-1-1, Section 21.D and

ASSE/SAFE Z359.2, be site specific, and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A competent person or qualified person for fall protection must prepare and sign the plan documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, roles and responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Review and revise, as necessary, the Fall Protection and Prevention Plan documentation as conditions change, but at a minimum every six months, for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Plan documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Plan documentation in the Accident Prevention Plan (APP).

1.8.2.5 Rescue and Evacuation Plan

Provide a Rescue and Evacuation Plan in accordance with EM 385-1-1 Section 21.N and ASSE/SAFE Z359.2, and include in the FP&P Plan and as part of the APP. Include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility.

1.8.2.6 Hazardous Energy Control Program (HECP)

Develop a HECP in accordance with EM 385-1-1 Section 12, 29 CFR 1910.147, 29 CFR 1910.333, 29 CFR 1915.89, ASSE/SAFE Z244.1, and ASSE/SAFE A10.44. Submit this HECP as part of the Accident Prevention Plan (APP). Conduct a preparatory meeting and inspection with all effected personnel to coordinate all HECP activities. Document this meeting and inspection in accordance with EM 385-1-1, Section 12.A.02. Ensure that each employee is familiar with and complies with these procedures.

1.8.2.7 Excavation Plan

Identify the safety and health aspects of excavation, and provide and prepare the plan in accordance with EM 385-1-1, Section 25.A and Section 31 00 00 EARTHWORK.

1.8.2.8 Occupant Protection Plan

Identify the safety and health aspects of lead-based paint removal, prepared in accordance with Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD.

1.8.2.9 Lead Compliance Plan

Identify the safety and health aspects of lead work, and prepare in accordance with Section 02 83 13.00 20 LEAD IN CONSTRUCTION.

1.8.2.10 Asbestos Hazard Abatement Plan

Identify the safety and health aspects of asbestos work, and prepare in accordance with Section 02 82 16.00 20 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS.

1.8.2.11 PCB Plan

Identify the safety and health aspects of Polychlorinated Biphenyls work, and prepare in accordance with Sections 02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY.

1.8.2.12 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION AND DECONSTRUCTION and referenced sources. Include engineering survey as applicable.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1, Section 1 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

1.9.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

1.9.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to ensure a clear understanding of the AHA and its contents.

1.10 DISPLAY OF SAFETY INFORMATION

1.10.1 Safety Bulletin Board

Within one calendar day after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method,

acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, may be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, Section 01.A.06. Additional items required to be posted include:

a. Confined space entry permit.

b. Hot work permit.

1.10.2 Safety and Occupational Health (SOH) Deficiency Tracking System

Establish a SOH deficiency tracking system that lists and monitors the status of SOH deficiencies in chronological order. Use the tracking system to evaluate the effectiveness of the APP. A monthly evaluation of the data must be discussed in the QC or SOH meeting with everyone on the project. The list must be posted on the project bulletin board and updated daily, and provide the following information:

a. Date deficiency identified;

b. Description of deficiency;

c. Name of person responsible for correcting deficiency;

d. Projected resolution date;

e. Date actually resolved.

1.11 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

1.12 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.13 NOTIFICATIONS and REPORTS

1.13.1 Mishap Notification

Notify the Contracting Officer as soon as practical, but no more than twenty-four hours, after any mishaps, including recordable accidents, incidents, and near misses, as defined in EM 385-1-1 Appendix Q, any report of injury, illness, load handling equipment (LHE) or rigging mishaps, or any property damage. The Contractor is responsible for obtaining appropriate medical and emergency assistance and for notifying fire, law enforcement, and regulatory agencies. Immediate reporting is required for electrical mishaps, to include Arc Flash; shock; uncontrolled release of hazardous energy (includes electrical and non-electrical); load handling equipment or rigging; fall from height (any level other than same surface); and underwater diving. These mishaps must be investigated in depth to identify all causes and to recommend hazard control measures.

Within notification include Contractor name; contract title; type of contract; name of activity, installation or location where accident

occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any mishap.

1.13.2 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS). The Contracting Officer will provide copies of any required or special forms.

b. Near Misses: For Navy Projects, complete the applicable documentation in NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS). Near miss reports are considered positive and proactive Contractor safety management actions.

c. Conduct an accident investigation for any load handling equipment accident (including rigging gear accidents) to establish the root cause(s) of the accident. Complete the LHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.13.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.13.4 Certificate of Compliance and Pre-lift Plan/Checklist for LHE and Rigging

Provide a FORM 16-1 Certificate of Compliance for LHE entering an activity under this contract and in accordance with EM 385-1-1. Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1, Section 16.H.03 using Form 16-2 Standard Pre-Lift Crane Plan/Checklist for each lift planned. Submit SLP to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

1.14 HOT WORK

1.14.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e. welding or cutting) or operating other flame-producing/spark producing devices, from the Fire Division. A permit is required from the Explosives Safety Office for work in and around where explosives are processed,

stored, or handled. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged, and contain an approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch must be trained in accordance with NFPA 51B and remain on-site for a minimum of one hour after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency Fire Division phone number. REPORT ANY FIRE, NO MATTER HOW SMALL, TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

1.15 RADIATION SAFETY REQUIREMENTS

Submit License Certificates, employee training records, and Leak Test Reports for radiation materials and equipment to the Contracting Officer and Radiation Safety Office (RSO)for all specialized and licensed material and equipment proposed for use on the construction project. Maintain on-site records whenever licensed radiological materials or ionizing equipment are on government property.

Protect workers from radiation exposure in accordance with 10 CFR 20, ensuring any personnel exposures are maintained As Low As Reasonably Achievable.

1.15.1 Radiography Operation Planning Work Sheet

Submit a Radiography Operation Planning Work Sheet to Contracting Officer 14 days prior to commencement of operations involving radioactive materials or radiation generating devices. The Contracting Officer will review this worksheet and submit questions and comments.

Contractors must use primary dosimeters process by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

1.15.2 Site Access and Security

Coordinate site access and security requirements with the Contracting Officer for all radiological materials and equipment containing ionizing radiation that are proposed for use on a government facility. The authorized representative will meet the Contractor at a designated location, ensure safety of the materials being transported, and will escort the Contractor to the job site and return upon completion of the work.

Provide a copy of all calibration records, and utilization records for radiological operations performed on the site.

1.15.3 Loss or Release and Unplanned Personnel Exposure

Loss or release of radioactive materials, and unplanned personnel exposures must be reported immediately to the Contracting Officer, RSO, and Base Security Department Emergency Number.

1.15.4 Site Demarcation and Barricade

Properly demark and barricade an area surrounding radiological operations

to preclude personnel entrance, in accordance with EM 385-1-1, Nuclear Regulatory Commission, and Applicable State regulations and license requirements, and in accordance with requirements established in the accepted Radiography Operation Planning Work Sheet.

Do not close or obstruct streets, walks, and other facilities occupied and used by the Government without written permission from the Contracting Officer.

1.15.5 Security of Material and Equipment

Properly secure the radiological material and ionizing radiation equipment at all times, including keeping the devices in a properly marked and locked container, and secondarily locking the container to a secure point in the Contractor's vehicle or other approved storage location during transportation and while not in use. While in use, maintain a continuous visual observation on the radiological material and ionizing radiation equipment. In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, make no assumptions as to building occupancy. Where necessary, the Contracting Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, position a fully instructed employee inside the building or area to prevent exiting while external radiographic operations are in process.

1.15.6 Transportation of Material

Comply with 49 CFR 173 for Transportation of Regulated Amounts of Radioactive Material. Notify Local Fire authorities and the site Radiation Safety officer (RSO) of any Radioactive Material use.

1.15.7 Schedule for Exposure or Unshielding

Actual exposure of the radiographic film or unshielding the source must not be initiated until after 5 p.m. on weekdays.

1.15.8 Transmitter Requirements

Adhere to the base policy concerning the use of transmitters, such as radios and cell phones. Obey Emissions control (EMCON) restrictions.

1.16 CONFINED SPACE ENTRY REQUIREMENTS.

Confined space entry must comply with Section 34 of EM 385-1-1, OSHA 29 CFR 1926, OSHA 29 CFR 1910, OSHA 29 CFR 1910.146, and OSHA Directive CPL 2.100. Any potential for a hazard in the confined space requires a permit system to be used.

1.16.1 Entry Procedures

Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. Comply with EM 385-1-1, Section 34 for entry procedures. Hazards pertaining to the space must be reviewed with each employee during review of the AHA.

1.16.2 Forced Air Ventilation

Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its action level.

1.16.3 Sewer Wet Wells

Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

1.16.4 Rescue Procedures and Coordination with Local Emergency Responders

Develop and implement an on-site rescue and recovery plan and procedures. The rescue plan must not rely on local emergency responders for rescue from a confined space.

1.17 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

a. Hard Hat

b. Long Pants

c. Appropriate Safety Shoes

d. Appropriate Class Reflective Vests

3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. An employee check-in/check-out communication procedure must be developed to ensure employee safety.

3.1.2 Hazardous Material Use

Each hazardous material must receive approval from the Contracting Office or their designated representative prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material.

3.1.3 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

3.1.4 Unforeseen Hazardous Material

Contract documents identify materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If material(s) that may be hazardous to human health upon disturbance are encountered during construction operations, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to FAR 52.243-4, "Changes" and FAR 52.236-2, "Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Apply for utility outages at least 15 days in advance. As a minimum, the request must include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out

procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate a Hazardous Energy Control Program (HECP) in accordance with EM 385-1-1 Section 12, 29 CFR 1910.333, 29 CFR 1915.89, and paragraph HAZARDOUS ENERGY CONTROL PROGRAM (HECP).

3.4 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with ASSE/SAFE Z359.2 and EM 385-1-1, Sections 21.A and 21.D.

3.4.1 Training

Institute a fall protection training program. As part of the Fall Protection Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with EM 385-1-1, Section 21.C. Document training and practical application of the competent person in accordance with EM 385-1-1, Section 21.C.04 and ASSE/SAFE Z359.2 in the AHA.

3.4.2 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21.

Provide personal fall protection equipment, systems, subsystems, and components that comply with EM 385-1-1 Section 21.I, 29 CFR 1926.500 Subpart M,ASSE/SAFE Z359.0, ASSE/SAFE Z359.1, ASSE/SAFE Z359.2, ASSE/SAFE Z359.3, ASSE/SAFE Z359.4, ASSE/SAFE Z359.6, ASSE/SAFE Z359.7, ASSE/SAFE Z359.11, ASSE/SAFE Z359.12, ASSE/SAFE Z359.13, ASSE/SAFE Z359.14, and ASSE/SAFE Z359.15.

3.4.2.1 Additional Personal Fall Protection

In addition to the required fall protection systems, other protection such as safety skiffs, personal floatation devices, and life rings, are required when working above or next to water in accordance with EM 385-1-1, Sections 21.O through 21.O.06. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

3.4.2.2 Personal Fall Protection Harnesses

Only a full-body harness with a shock-absorbing lanyard or self-retracting

lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable. Harnesses must have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Snap hooks and carabiners must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 3,600 lbs in all directions. Use webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment must not exceed 6 feet, unless the proper energy absorbing lanyard is used. Always take into consideration the total fall distance and any swinging of the worker (pendulum-like motion), that can occur during a fall, when attaching a person to a fall arrest system. All full body harnesses must be equipped with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance in accordance with EM 385-1-1, Section 21.I.06.

3.4.3 Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

   1. For work within 6 feet of an edge, on a roof having a slope less than or equal to 4:12 (vertical to horizontal), protect personnel from falling by use of personal fall arrest/restraint systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized. Provide in accordance with 29 CFR 1926.500.

   2. For work greater than 6 feet from an edge, erect and install warning lines in accordance with 29 CFR 1926.500 and EM 385-1-1, Section L.

b. Steep-Sloped Roofs: Work on a roof having a slope greater than 4:1 (vertical to horizontal) requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also applies to residential or housing type construction.

3.4.4 Horizontal Lifelines (HLL)

Provide HLL in accordance with EM 385-1-1, Section 21.I.08.d.2. Commercially manufactured horizontal lifelines (HLL) must be designed, installed, certified and used, under the supervision of a qualified person, for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500). The competent person for fall protection may (if deemed appropriate by the qualified person) supervise the assembly, disassembly, use and inspection of the HLL system under the direction of the qualified person. Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site specific applications by a Registered Professional Engineer who is qualified in designing HLL systems.

3.4.5 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with

EM 385-1-1, Section 21.F.01 and 29 CFR 1926 Subpart M.

3.4.6 Rescue and Evacuation Plan and Procedures

When personal fall arrest systems are used, ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue or assisted-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP). The plan must comply with the requirements of EM 385-1-1, ASSE/SAFE Z359.2, and ASSE/SAFE Z359.4.

3.5 WORK PLATFORMS

3.5.1 Scaffolding

Provide employees with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Comply with the following requirements:

a. Scaffold platforms greater than 20 feet in height must be accessed by use of a scaffold stair system.

b. Ladders commonly provided by scaffold system manufacturers are prohibited for accessing scaffold platforms greater than 20 feet maximum in height.

c. An adequate gate is required.

d. Employees performing scaffold erection and dismantling must be qualified.

e. Scaffold must be capable of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan.

f. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

g. Special care must be given to ensure scaffold systems are not overloaded.

h. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited. The first tie-in must be at the height equal to 4 times the width of the smallest dimension of the scaffold base.

i. Scaffolding other than suspended types must bear on base plates upon wood mudsills (2 in x 10 in x 8 in minimum) or other adequate firm foundation.

j. Scaffold or work platform erectors must have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet.

k. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.5.2 Elevated Aerial Work Platforms (AWPs)

Workers must be anchored to the basket or bucket in accordance with manufacturer's specifications and instructions (anchoring to the boom may only be used when allowed by the manufacturer and permitted by the CP). Lanyards used must be sufficiently short to prohibit worker from climbing out of basket. The climbing of rails is prohibited. Lanyards with built-in shock absorbers are acceptable. Self-retracting devices are not acceptable. Tying off to an adjacent pole or structure is not permitted unless a safe device for 100 percent tie-off is used for the transfer.

Use of AWPs must be operated, inspected, and maintained as specified in the operating manual for the equipment and delineated in the AHA. Operators of AWPs must be designated as qualified operators by the Prime Contractor. Maintain proof of qualifications on site for review and include in the AHA.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment (MHE)

a. Material handling equipment such as forklifts must not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Material handling equipment fitted with personnel work platform attachments are prohibited from traveling or positioning while personnel are working on the platform.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions. Material Handling Equipment Operators must be trained in accordance with OSHA 29 CFR 1910, Subpart N.

c. Operators of forklifts or power industrial trucks must be licensed in accordance with OSHA.

3.6.2 Load Handling Equipment (LHE)

a. Equip cranes and derricks as specified in EM 385-1-1, Section 16.

b. Notify the Contracting Officer 15 working days in advance of any LHE entering the activity, in accordance with EM 385-1-1, Section 16.A.02, so that necessary quality assurance spot checks can be coordinated. Prior to cranes entering federal activities, a Crane Access Permit must be obtained from the Contracting Officer. A copy of the permitting process will be provided at the Preconstruction Conference. Contractor's operator must remain with the crane during the spot check. Rigging gear must comply with OSHA, ASME B30.9 Standards safety standards.

c. Comply with the LHE manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.

d. Comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, ASME B30.8 for floating cranes and floating derricks, ASME B30.9 for slings, ASME B30.20 for below the hook lifting devices and ASME B30.26 for rigging hardware.

e. Under no circumstance must a Contractor make a lift at or above 90 percent of the cranes rated capacity in any configuration.

f. When operating in the vicinity of overhead transmission lines, operators and riggers must be alert to this special hazard and follow the requirements of EM 385-1-1 Section 11, and ASME B30.5 or ASME B30.22 as applicable.

g. Do not use crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane. Additionally, submit a specific AHA for this work to the Contracting Officer. Ensure the activity and AHA are thoroughly reviewed by all involved personnel.

h. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

i. All employees must keep clear of loads about to be lifted and of suspended loads.

j. Use cribbing when performing lifts on outriggers.

k. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

l. A physical barricade must be positioned to prevent personnel access where accessible areas of the LHE's rotating superstructure poses a risk of striking, pinching or crushing personnel.

m. Maintain inspection records in accordance by EM 385-1-1, Section 16.D, including shift, monthly, and annual inspections, the signature of the person performing the inspection, and the serial number or other identifier of the LHE that was inspected. Records must be available for review by the Contracting Officer.

n. Maintain written reports of operational and load testing in accordance with EM 385-1-1, Section 16.F, listing the load test procedures used along with any repairs or alterations performed on the LHE. Reports must be available for review by the Contracting Officer.

o. Certify that all LHE operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

p. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. At wind speeds greater than 20 mph, the operator, rigger and lift supervisor must cease all crane operations, evaluate conditions and determine if the lift may proceed. Base the determination to proceed or not on wind calculations per the manufacturer and a reduction in LHE rated capacity if applicable. Include this maximum wind speed determination as part of the activity hazard analysis plan for that operation.

3.6.3 Machinery and Mechanized Equipment

a. Proof of qualifications for operator must be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment must be on-site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Incorporate such additional safety precautions or requirements into the AHAs.

3.7 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

3.7.1 Utility Locations

Provide a third party, independent, private utility locating company to positively identify underground utilities in the work area in addition to any station locating service and coordinated with the station utility department.

3.7.2 Utility Location Verification

Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company must locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the Contractor from meeting this requirement.

3.8 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1, Appendix A, Sections 11 and 12.

3.8.1 Conduct of Electrical Work

As delineated in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to

be worked energized. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator is allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method.

When working in energized substations, only qualified electrical workers are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves and electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

3.8.2 Qualifications

Electrical work must be performed by QP personnel with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with State, Local requirements applicable to where work is being performed.

3.8.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

3.8.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

Check grounding circuits to ensure that the circuit between the ground and a grounded power conductor has a resistance low enough to permit sufficient current flow to allow the fuse or circuit breaker to interrupt the current.

3.8.5 Testing

Temporary electrical distribution systems and devices must be inspected,

tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
11/14

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 300
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@aip.org
Internet: http://asa.aip.org

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: amca@amca.org
Internet: http://www.amca.org

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
Ph: 703-524-8800
Fax: 703-562-1942
Internet: http://www.ahrinet.org

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960
E-Mail: info@aluminum.org

Internet: http://www.aluminum.org

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: customerservice@aamanet.org
Internet: http://www.aamanet.org

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: http://www.aashto.org

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: http://www.concrete.org

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020 or 513-742-6163
Fax: 513-742-3355
E-mail: mail@acgih.org
Internet: http://www.acgih.org

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: http://domensino.com/AHA/

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)
3141 Fairview Park Dr, Suite 777
Falls Church, VA 22042
Tel: 703-849-8888
Fax: 703-207-3561
E-mail: infonet@aiha.org
Internet http://www.aiha.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Bookstore: 800-644-2400
E-mail: aisc@ware-pak.com
Internet: http://www.aisc.org

AMERICAN IRON AND STEEL INSTITUTE (AISI)
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001
Ph: 202-452-7100
Internet: http://www.steel.org

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: http://www.alsc.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW,11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: storemanager@ansi.org
Internet: http://www.ansi.org/

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)
4501 Forbes Blvd., Suite 130
Lanham, MD 20706
Ph: 301-459-3200
Fax: 301-459-8077
E-mail: bcaruso@arema.org
Internet: http://www.arema.org

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191
Ph: 703-295-6300; 800-548-2723
E-mail: member@asce.org
Internet: http://www.asce.org

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: http://www.ashrae.org

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018
Ph: 847-699-2929
Internet: http://www.asse.org

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448
Ph: 708-995-3019
Fax: 708-479-6139

E-mail: staffengineer@asse-plumbing.org
Internet: http://www.asse-plumbing.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235-3098
Ph: 303-794-7711
E-mail: distribution@awwa.org
Internet: http://www.awwa.org

AMERICAN WELDING SOCIETY (AWS)
13301 NW 47 Ave
Miami, FL 33054

Ph: 888-WELDING, 305-824-1177, 305-826-6192
Fax: 305-826-6195
E-mail: customer.service@awspubs.com
Internet: http://www.aws.org

AMERICAN WOOD COUNCIL (AWC)
222 Catoctin Circle SE, Suite 201
Leesburg, VA 20175
Ph: 800-890-7732
Fax: 412-741-0609
E-mail: publications@awc.org
Internet: http://www.awc.org

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
Internet: http://www.awpa.com

AmericanHort (AH)
2130 Stella Court
Columbus, OH 43215 USA
Ph: 614-487-1117
Fax: 614-487-1216
E-mail: hello@AmericanHort.org
Internet: http://americanhort.org/AmericanHort/AmericanHort

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
Internet: http://www.apawood.org

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
Ph: 571-323-3636
Fax: 571-323-3630
E-mail: info@awinet.org
Internet: http://www.awinet.org

ARCNET TRADE ASSOCIATION (ATA)
E-mail: info@arcnet.com

Internet: http://www.arcnet.com/index.htm</URL

ASME INTERNATIONAL (ASME)
Two Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: http://www.asme.org

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
E-mail: info@aabc.com
Internet: http://www.aabc.com/

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 877-909-2786
Internet: http://www.astm.org

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (Bay Area AQMD)
939 Ellis Street
San Francisco, CA 94109
Ph: 415-771-6000
Fax: 415-928-8560
E-Mail: publicrecords@baaqmd.gov
Internet: http://www.baaqmd.gov/

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue, 15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
Internet: http://www.buildershardware.com

CALIFORNIA ENERGY COMMISSION (CEC)
Media and Public Communications Office
1516 Ninth Street, MS-29
Sacramento, CA 95814-5512
Ph: 916-654-5106
E-mail: appliances@energy.ca.gov
Internet: http://www.energy.ca.gov/

CAST IRON SOIL PIPE INSTITUTE (CISPI)
3008 Preston Station Drive
Hixson, TN 37343
Ph: 423-842-2122
Internet: http://www.cispi.org

COMPOSITE PANEL ASSOCIATION (CPA)
19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588
Internet: http://www.compositepanel.org/

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 North Plum Grove Road
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: http://www.crsi.org/

CONSUMER ELECTRONICS ASSOCIATION (CEA)
1919 South Eads St.
Arlington, VA 22202
Ph: 866-858-1555 or 703-907-7634
Fax: 866-858-2555 or 703-907-7693
E-mail: standards@CE.org
Internet: http://www.CE.org

COPPER DEVELOPMENT ASSOCIATION (CDA)
Internet: http://www.copper.org

CSA GROUP (CSA)
178 Rexdale Blvd.
Toronto, ON, Canada M9W 1R3
Ph: 416-747-4044
Fax: 416-747-2510
E-mail: sales@csagroup.org
Internet: http://www.csagroup.org/us/en/home

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)
2214 Rock Hill Rd., Suite 170
Herndon, VA 20170
Ph: 571-323-0294
Fax: 571-323-0245
E-mail: emikoski@ecaus.org
Internet: http://www.ecianow.org/

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919-4923
Ph: 877-364-6726
Fax: 401-275-3029
E-mail: servicedesk.myrisk@fmglobal.com
Internet: http://www.fmglobal.com

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)
University of South California
Research Annex 219
3716 South Hope Street
Los Angeles, CA 90089-7700
Ph: 213-740-2032 or 866-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: http://www.usc.edu/dept/fccchr

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
800 SW Jackson St., Suite 1500
Topeka, KS 66612-1200
Ph: 785-271-0208

E-mail: gana@glasswebsite.com
Internet: http://www.glasswebsite.com

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
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Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
Internet: http://www.greenseal.org

GYPSUM ASSOCIATION (GA)
6525 Belcrest Road, Suite 480
Hyattsville, MD 20782
Ph: 301-277-8686
Fax: 301-277-8747
E-mail: info@gypsum.org
Internet: http://www.gypsum.org

HYDRAULIC INSTITUTE (HI)
6 Campus Drive, First Floor North
Parsippany, NJ 07054-4406
Ph: 973-267-9700
Fax: 973-267-9055
Internet: http://www.pumps.org

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 and 501 Hoes Lane
Piscataway, NJ 08854-4141
Ph: 732-981-0060 or 800-701-4333
Fax: 732-562-9667
E-mail: onlinesupport@ieee.org
Internet: http://www.ieee.org

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION CERTIFICATION (IICRC)
IICRC Headquarters
4317 NE Thurston Way, Suite 200
Vancouver, WA 98662
Ph: 360-693-5675
Fax: 360-693-4858
E-mail: info@iicrc.org
Internet: http://www.iicrc.org/home

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 1568
Carrollton, GA 30112
E-mail:
http://www.icea.net/Public_Pages/Contact/Email_Contact.html
Internet: http://www.icea.net

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)
27 N. Wacker Dr. Suite 365
Chicago, IL 60606-2800
Ph: 613-233-1510
Fax: 613-482-9436
E-mail: enquiries@igmaonline.org
Internet: http://www.igmaonline.org

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)
800 Place Victoria
PO Box 113
Montréal, Quebec, H4Z 1M1
Ph: 514-390-6726 or 800-716-6326
Fax: 514-874-9659
E-mail: custserv@iata.org
Internet: http://www.iata.org

INTERNATIONAL CODE COUNCIL (ICC)
500 New Jersey Avenue, NW
6th Floor, Washington, DC 20001
Ph: 800-786-4452 or 888-422-7233
E-mail: order@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
3050 Old Centre Ave. Suite 102
Portage, MI 49024
Ph: 269-488-6382
Internet: http://www.netaworld.org

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
3, rue de Varembe
P.O. Box 131
CH-1211 Geneva 20, Switzerland
Ph: 41-22-919-02-11
Fax: 41-22-919-03-00
Internet: http://www.iec.ch

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, ch. de la Voie-Creuse
Case Postale 56
CP 56 - CH-1211 Geneva 20
Switzerland
Ph: 41-22-749-01-11
Fax: 41-22-733-34-30
E-mail: central@iso.ch
Internet: http://www.iso.org

L.H. BAILEY HORTORIUM (LHBH)
Dept of Plant Biology
c/o Cornell University
440 Mann Library Building
Ithaca, NY 14853
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Fax: 607-254-5407
Internet: http://plantbio.cals.cornell.edu/hortorium

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Internet: http://mss-hq.org/Store/index.cfm

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E-mail: info@paintinfo.com or techservices@mpi.net
Internet: http://www.mpi.net/

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
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Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: mbma@mbma.com
Internet: http://www.mbma.com

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)
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Omaha, NE 68130
Ph: 800-747-6422
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E-mail: info@nadca.com
Internet: http://www.nadca.com

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
800 Roosevelt Road, Bldg C, Suite 312
Glen Ellyn, IL 60137
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Fax: 630-790-3095
E-mail: wlewis7@cox.net(Wes Lewis,technical consultant)
Internet: http://www.naamm.org

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
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Bethesda, MD 20814
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Fax: 301-215-4500
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Internet: http://www.nema.org/

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)
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Gaithersburg, MD 20877
Ph: 301-977-3698
Fax: 301-977-9589
Internet: http://www.nebb.org

NATIONAL FENESTRATION RATING COUNCIL (NFRC)
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Ph: 301-589-1776
Fax: 301-589-3884
E-Mail: info@nfrc.org
Internet: http://www.nfrc.org

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
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Quincy, MA 02169-7471
Ph: 617-770-3000
Fax: 617-770-0700
Internet: http://www.nfpa.org

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)
6830 Raleigh LaGrange Road
PO Box 34518
Memphis, TN 38184
Ph: 901-377-1818
Store: 901-399-7563
Internet: http://www.nhla.org

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
100 Bureau Drive
Stop 1070
Gaithersburg, MD 20899-1070
Ph: 301-975-NIST (6478)
E-mail: inquiries@nist.gov
Internet: http://www.nist.gov

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)
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Ph: 207-829-6901
Fax: 207-829-4293
E-mail: info@nelma.org
Internet: http://www.nelma.org

NSF INTERNATIONAL (NSF)
789 North Dixboro Road
P.O. Box 130140
Ann Arbor, MI 48105
Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
E-mail: info@nsf.org
Internet: http://www.nsf.org

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road
Building C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: http://www.ppfahome.org

PLUMBING AND DRAINAGE INSTITUTE (PDI)
800 Turnpike Street, Suite 300
North Andover, MA 01845

Ph: 978-557-0720 or 800-589-8956
E-Mail: pdi@PDIonline.org
Internet: http://www.pdionline.org

PORCELAIN ENAMEL INSTITUTE (PEI)
PO Box 920220
Norcross, GA 30010
Ph: 770-409-7280
Fax: 770-409-7280
E-mail: penamel@aol.com
Internet: http://www.porcelainenamel.com

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)
818 Grayson Road, Suite 201
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Ph: 925-935-1499
Fax: 925-935-1496
E-Mail: ris@calredwood.org
Internet: http://www.redwoodinspection.com/

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)
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Emeryville, CA 94608
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SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1219
Ph: 703-803-2980
Fax: 703-803-3732
Internet: http://www.smacna.org

SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: http://www.sspc.org

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096
Ph: 724-776-4970
Fax: 877-606-7323
E-mail: customerservice@sae.org
Internet: http://www.sae.org

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)
21865 Copley Drive
Diamond Bar, CA 91765
Ph: 909-396-2000
E-mail: webinquiry@aqmd.gov
Internet: http://www.aqmd.gov

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)
665 Rodi Road, Suite 305
Pittsburgh, PA 15235
Ph: 412-244-0440
Fax: 412-244-9090
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Internet: http://www.cypressinfo.org

SOUTHERN PINE INSPECTION BUREAU (SPIB)
P.O. Box 10915
Pensacola, FL 32504-0915
Ph: 850-434-2611
Fax: 850-433-5594
Internet: http://www.spib.org

STEEL DOOR INSTITUTE (SDI/DOOR)
30200 Detroit Road
Westlake, OH 44145
Ph: 440-899-0010
Fax: 440-892-1404
E-mail: info@steeldoor.org
Internet: http://www.steeldoor.org

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
1320 N. Courthouse Rd., Suite 200
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: http://www.tiaonline.org

TILE COUNCIL OF NORTH AMERICA (TCNA)
100 Clemson Research Boulevard
Anderson, SC 29625
Ph: 864-646-8453
Fax: 864-646-2821
E-mail: info@tileusa.com
Internet: http://www.tcnatile.com/

TREE CARE INDUSTRY ASSOCIATION (TCIA)
136 Harvey Road, Suite 101
Londonderry, NH 03053
Ph: 603-314-5380
Fax: 603-314-5386
Internet: http://tcia.org/

U.S. ARMY CORPS OF ENGINEERS (USACE)
CRD-C DOCUMENTS available on Internet:
http://www.wbdg.org/ccb/browse_cat.php?c=68
Order Other Documents from:
USACE Publications Depot
Attn: CEHEC-IM-PD
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081
Fax: 301-394-0084
E-mail: pubs-army@usace.army.mil
Internet: http://www.publications.usace.army.mil/
or
http://www.hnc.usace.army.mil/Missions/Engineering/TECHINFO.aspx

U.S. DEFENSE LOGISTICS AGENCY (DLA)

Fort Belvoir, VA

Internet: http://www.dla.mil

U.S. DEPARTMENT OF AGRICULTURE (USDA)
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E-mail: seed.ams@usda.gov
Internet: http://www.ams.usda.gov/lsg/seed.htm
Order Other Publications from:
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USDA Rural Development, Room 4051-S
Mail Stop 1510
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Washington, DC 20250-1510
Phone: (202) 720-9540
TTY: (800) 877-8339 (Federal Relay Service)
Fax: (202) 720-1725
Internet: http://www.rurdev.usda.gov/utilities_lp.html

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Washington, DC 20301-1400
Ph: 703-571-3343
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Internet: http://www.ntis.gov
Obtain Military Specifications, Standards and Related Publications from:
Acquisition Streamlining and Standardization Information System (ASSIST)
Department of Defense Single Stock Point (DODSSP)
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Building 4/D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: http://assist.daps.dla.mil/online/start/; account registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700
Washington, CD 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet: http://www.wbdg.org/references/docs_refs.php

U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independence Avenue Southwest
Washington, D.C. 20585
Internet: www.eere.energy.gov

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
HUD User
P.O. Box 23268
Washington, DC 20026-3268
Ph: 800-245-2691 or 202-708-3178
TDD: 800-927-7589
Fax: 202-708-9981
Internet: http://www.huduser.org

U.S. DEPARTMENT OF TRANSPORTATION (DOT)
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Washington, DC 20590
Ph: 202-366-4000
Internet: http://www.dot.gov

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
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Washington, DC 20004
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Internet: http://www2.epa.gov/libraries
--- Some EPA documents are available only from:
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5301 Shawnee Road
Alexandria, VA 22312
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Washington, DC 20417
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Acquisition Streamlining and Standardization Information System (ASSIST)
Internet: https://assist.dla.mil/online/start/; account registration required

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Washington, D.C. 20037
Ph: 800-795-1747
Internet: http://www.usgbc.org

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
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Internet: http://www.gpoaccess.gov

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)
1322 Patterson Ave. SE, Suite 1000
Washington Navy Yard, DC 20374-5065
Ph: 202-685-9387
Internet: http://www.navfac.navy.mil

UL ENVIRONMENT (ULE)
2211 Newmarket Parkway, Suite 106
Marietta, GA 30067
Ph: 770-933-0638
Fax: 770-980-0072
E-mail: environment@ul.com
Intertet: http://www.ul.com/environment

UNDERWRITERS LABORATORIES (UL)
2600 N.W. Lake Road
Camas, WA 98607-8542
Ph: 877-854-3577
E-mail: CEC.us@us.ul.com
Internet: http://www.ul.com/
UL Directories available through IHS at http://www.ihs.com

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
P.O. Box 23145
Portland, OR 97281
Ph: 503-639-0651
Fax: 503-684-8928
E-mail: info@wclib.org
Internet: http://www.wclib.org

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
1500 SW First Ave., Suite 870
Portland, OR 97201
Ph: 503-224-3930
Fax: 503-224-3934
E-mail: info@wwpa.org
Internet: http://www.wwpa.org

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
330 N Wabash Avenue, Suite 2000
Chicago, IL 60611
Ph: 312-321-6802
E-mail: wdma@wdma.com
Internet: http://www.wdma.com

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 00.00 20

QUALITY CONTROL
11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.2	(2012; Errata 2013; INT 1 2014; ADD A, B, AND D SUPP 2015; INT 3 2015) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

ASTM INTERNATIONAL (ASTM)

ASTM D6245	(2012) Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
ASTM D6345	(2010) Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

ANSI/SMACNA 008	(2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval.

SD-01 Preconstruction Submittals

Construction Quality Control (QC) Plan; G

Submit a Construction QC Plan prior to start of construction.

Indoor Air Quality (IAQ) Management Plan; G

Basis of Design and Design Intent

1.3 INFORMATION FOR THE CONTRACTING OFFICER

Prior to commencing work on construction, the Contractor can obtain a single copy set of the current report forms from the Contracting Officer. The report forms will consist of the Contractor Production Report, Contractor Production Report (Continuation Sheet), Contractor Quality Control (CQC) Report, CQC Report (Continuation Sheet), Preparatory Phase Checklist, Initial Phase Checklist, Rework Items List, and Testing Plan and Log.

Deliver the following to the Contracting Officer during Construction:

a. CQC Report: Submit the report electronically, Mail or hand-carry the original (wet signatures) and one copy by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work.

b. Contractor Production Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work. Mail or hand-carry the original (wet signatures) and one copy by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work, attached to the CQC Report.

c. Preparatory Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Preparatory Phase held. Original attached to the original CQC Report and one copy attached to each QC Report copy.

d. Initial Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Initial Phase held. Original attached to the original CQC Report and one copy attached to each QC Report copy.

e. Field Test Reports: Witin two working days after the test is performed, submit the report as an electronic attachment to the CQC Report. Mail or hand-carry the original within two working days after the test is performed, attached to the original CQC Report and one copy attached to each QC Report copy.

f. Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month. Mail or hand-carry the original attached to the last QC Report of the month.

g. Testing Plan and Log: Submit the report as an electronic attachment to the CQC Report, at the end of each month. Provide a copy of the final Testing Plan and Log to the OMSI preparer for inclusion into the OMSI documentation. Mail or hand-carry the original attached to the last CQC Report of each month and one copy attached to each CQC Report copy. Provdie a copy of the final Testing Plan and Log to the OMSI preparer for inclusion into the OMSI documentation.

h. Rework Items List: Submit lists containing new entries daily, in the same manner as the CQC Report. Mail or hand-carry the original attached to the last CQC Report of each month and one copy attached to each CQC Report copy.

i. CQC Meeting Minutes: Within two working days after the meeting is

held, submit the report as an electronic attachment to the CQC Report. Mail or hand-carry the original within two working days after the meeting is held, attached to the original CQC Report and one copy attached to each CQC Report copy.

j. QC Certifications: As required by the paragraph entitled "QC Certifications."

k. Special Inspection Report: Submit the Special Inspection reports, in the same manner as the CQC Report.

1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. This QC program is a key element in meeting the objectives of NAVFAC Commissioning. The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, QC certifications independent Special Inspections in accordance with Section 01 45 35 SPECIAL INSPECTIONS, and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract. The QC program must cover on-site and off-site work and be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for quality control, all individuals will be held responsible for the quality of work on the job.

1.4.1 Commissioning

Commissioning (Cx) is a systematic process of ensuring that all building systems meet the requirements and perform interactively according to the Contract. The QC Program is a key to this process by coordinating, verifying and documenting measures to achieve the following objectives:

a. Verify and document that the applicable equipment and systems are installed in accordance with the design intent as expressed through the Contract and according to the manufacturer's recommendations and industry accepted minimum standards.

b. Verify and document that equipment and systems receive complete operational checkout by the installing contractors.

c. Verify and document proper performance of equipment and systems.

d. Verify that Operation and Maintenance (O&M) documentation is complete.

e. Verify the Training Plan and training materials are accurate and provide correct instruction and documentation on the critical elements of the products, materials, and systems in the constructed facility. Verify that all identified Government operating personnel are trained.

f. Verify and document that all contract requirements for LEED fundamental commissioning are met.

1.4.2 Acceptance of the Construction Quality Control (QC) Plan

Acceptance of the QC Plan is required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including removal of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time in order to verify the submitted qualifications. All QC organization personnel are subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the Contract.

1.4.3 Preliminary Construction Work Authorized Prior to Acceptance

The only construction work that is authorized to proceed prior to the acceptance of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying.

1.4.4 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel, a minimum of 10 work days prior to a proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

1.4.5 Special Inspections

Perform all required Special Inspections per Section 01 45 35 SPECIAL INSPECTIONS, the statement of Special Inspections and the Schedule of Special Inspections.

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program, and to serve as the Site Safety and Health Officer (SSHO) as detailed in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The QC Manager is required to attend the partnering meetings, QC Plan Meetings, Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control except for those phases of control designated to be performed by QC Specialists, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC Specialists, testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities. The QC manager is responsible for notifying the Special Inspector of activities which require their review. The QC manager is responsible for coordinating the Special Inspection activities, see paragraph QUALITY CONTROL MANAGER, in Section 01 45 35 SPECIAL INSPECTIONS.

1.5.1.2 Qualifications

An individual with a minimum of 5 years combined experience in the following positions: Project Superintendent, QC Manager, Project Manager,

Project Engineer or Construction Manager on similar size and type construction contracts which included the major trades that are part of this Contract. The individual must have at least two years experience as a QC Manager. The individual must be familiar with the requirements of EM 385-1-1, and have experience in the areas of hazard identification, safety compliance, and sustainability.

1.5.2 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager must have completed the course entitled "Construction Quality Management (CQM) for Contractors." If the QC Manager does not have a current certification, they must obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

1.5.3 Alternate QC Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager must be the same as for the QC Manager.

1.5.4 Special Inspector

The Special Inspector (SI) must be an independent third party hired directly by the Prime Contractor. The SI must not be a company employee of the Contractor or any Sub-Contractor performing the work to be inspected. The qualifications of the SI are defined in Section 01 45 35 SPECIAL INSPECTION.

1.5.5 Registered Fire Protection Engineer

The U.S. Registered Fire Protection Engineer (FPE) must be an independent third party hired directly by the Prime Contractor as an integral part of the Prime Contractor's Quality Control Organization. This FPE must have no business relationships (owner, partner, operating officer, distributor, salesman, or technical representative) with any subcontractors involved with this project, or with any fire protection equipment device manufacturers, suppliers or installers for any such equipment provided as part of this project. This FPE is responsible for review, approval, and coordination of all fire protection system material submittals, calculations, shop drawings, etc.

1.5.6 Submittal Reviewer Duties and Qualifications

Provide a Submittal Reviewer, other than the QC Manager or CA, qualified in the discipline being reviewed, to review and certify that the submittals meet the requirements of this Contract prior to certification or approval by the QC Manager.

Each submittal must be reviewed by an individual with 10 years of construction experience or a Registered Architect or Professional Engineer.

1.6 QUALITY CONTROL (QC) PLAN

1.6.1 Construction Quality Control (QC) Plan

1.6.1.1 Requirements

Provide, for acceptance by the Contracting Officer, a Construction QC Plan submitted in a three-ring binder that includes a table of contents, with major sections identified with tabs, with pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing quality control commissioning activities during the construction of the project:

a. QC ORGANIZATION: A chart showing the QC organizational structure.

b. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, for each person in the QC organization. Include the CQM for Contractors course certifications for the QC Manager and Alternate QC Manager as required by the paragraphs entitled "Construction Quality Management Training" and "Alternate QC Manager Duties and Qualifications".

c. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.

d. OUTSIDE ORGANIZATIONS: A listing of outside organizations, such as architectural and consulting engineering firms, that will be employed by the Contractor and a description of the services these firms will provide.

e. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work which is not in compliance with the Contract. Letters of direction are to be issued by the QC Manager to all other QC Specialists outlining their duties, authorities, and responsibilities. Include copies of the letters in the QC Plan.

f. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving, and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in Section 01 33 00 SUBMITTAL PROCEDURES.

g. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraphs entitled "Accreditation Requirements", as applicable.

h. TESTING PLAN AND LOG: A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test. Use Government forms to log and track tests.

i. PROCEDURES TO COMPLETE REWORK ITEMS: Procedures to identify, record,

track, and complete rework items. Use Government forms to record and track rework items.

j. DOCUMENTATION PROCEDURES: Use Government form.

k. LIST OF DEFINABLE FEATURES: A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines and is an item or activity on the construction schedule. Include in the list of DFOWs, but not be limited to, all critical path activities on the NAS. Include all activities for which this specification requires QC Specialists or specialty inspection personnel. Provide separate DFOWs in the Network Analysis Schedule for each design development stage and submittal package.

l. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL: Identify procedures used to ensure the three phases of control to manage the quality on this project. For each DFOW, a Preparatory and Initial phase checklist will be filled out during the Preparatory and Initial phase meetings. Conduct the Preparatory and Initial Phases and meetings with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

m. PERSONNEL MATRIX: A personnel matrix showing for each section of the specification who will review and approve submittals, who will perform and document the three phases of control, and who will perform and document the testing.

n. PROCEDURES FOR COMPLETION INSPECTION: Procedures for identifying and documenting the completion inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.

o. TRAINING PROCEDURES AND TRAINING LOG: Not Applicable.

p. ORGANIZATION AND PERSONNEL CERTIFICATIONS LOG: Procedures for coordinating, tracking and documenting all certifications on subcontractors, testing laboratories, suppliers, personnel, etc. QC Manager will ensure that certifications are current, appropriate for the work being performed, and will not lapse during any period of the contract that the work is being performed.

1.7 COORDINATION AND MUTUAL UNDERSTANDING MEETING

After submission of the QC Plan, and prior to Government approval and the start of construction, the QC Manager will meet with the Contracting Officer to present the QC program required by this Contract. When a new QC Manager is appointed, the coordination and mutual understanding meeting must be repeated.

1.7.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, design intent, Cx, environmental requirements and procedures, coordination of activities to be performed, Special Inspections, and the coordination of the Contractor's management, production, and QC personnel. At the meeting, the Contractor will be required to explain in

detail how three phases of control will be implemented for each DFOW, as well as how each DFOW will be affected by each management plan or requirement as listed below:

a. Waste Management Plan.

b. IAQ Management Plan.

c. Procedures for noise and acoustics management.

d. Environmental Protection Plan.

e. Environmental regulatory requirements.

f. Special Inspections.

1.7.2 Coordination of Activities

Coordinate activities included in various sections to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. Schedule construction operations with consideration for indoor air quality as specified in the IAQ Management Plan. Coordinate prefunctional tests and startup testing with Cx. Coordinate special inspections.

1.7.3 Attendees

As a minimum, the Contractor's personnel required to attend include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, Alternate QC Manager, Special Inspector, CA, Environmental Manager, and subcontractor representatives. Each subcontractor who will be assigned QC responsibilities must have a principal of the firm at the meeting. Minutes of the meeting will be prepared by the QC Manager and signed by the Contractor, the A/E and the Contracting Officer. Provide a copy of the signed minutes to all attendees and include in the QC Plan.

1.8 QC MEETINGS

After the start of construction, conduct QC meetings once every two weeks by the QC Manager at the work site with the Project Superintendent, the Special Inspector, the CA, and the foremen who are performing the work of the DFOWs. The QC Manager is to prepare the minutes of the meeting and provide a copy to the Contracting Officer within two working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, accomplish the following at each meeting:

a. Review the minutes of the previous meeting.

b. Review the schedule and the status of work and rework.

c. Review the status of submittals.

d. Review the work to be accomplished in the next two weeks and documentation required.

e. Resolve QC and production problems (RFI, etc.).

f. Address items that may require revising the QC Plan.

g. Review Accident Prevention Plan (APP).

h. Review environmental requirements and procedures.

i. Review Waste Management Plan.

j. Review IAQ Management Plan.

k. Review Environmental Management Plan.

l. Review the status of training completion.

m. Review Cx Plan and progress.

1.9 THREE PHASES OF CONTROL

Adequately cover both on-site and off-site work with the Three Phases of Control and include the following for each DFOW.

1.9.1 Preparatory Phase

Notify the Contracting Officer at least two work days in advance of each preparatory phase meeting. The meeting will be conducted by the QC Manager and attended by the Project Superintendent, the CA, the Special Inspector, and the foreman responsible for the DFOW. When the DFOW will be accomplished by a subcontractor, that subcontractor's foreman must attend the preparatory phase meeting. Document the results of the preparatory phase actions in the Contractor Quality Control Report and in the Preparatory Phase Checklist. Perform the following prior to beginning work on each DFOW:

a. Review each paragraph of the applicable specification sections.

b. Review the Contract drawings.

c. Verify that field measurements are as indicated on construction and/or shop drawings before confirming product orders, in order to minimize waste due to excessive materials.

d. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.

e. Review the testing plan and ensure that provisions have been made to provide the required QC testing.

f. Review special inspections required by Section 01 45 35 SPECIAL INSPECTION, the statement of special inspections and the schedule of special inspections.

g. Examine the work area to ensure that the required preliminary work has been completed.

h. Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

i. Arrange for the return of shipping/packaging materials, such as wood

pallets, where economically feasible.

j. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data and are properly stored.

k. Discuss specific controls used and construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFOW.

l. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.

m. Review the Cx Plan and ensure all preliminary work items have been completed and documented.

1.9.2 Initial Phase

Notify the Contracting Officer at least two work days in advance of each initial phase. When construction crews are ready to start work on a DFOW, conduct the initial phase with the Project Superintendent, the Special Inspector, and the foreman responsible for that DFOW. Observe the initial segment of the DFOW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily CQC Report and in the Initial Phase Checklist. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. Perform the following for each DFOW:

a. Establish level of workmanship and verify that it meets the minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

b. Resolve any workmanship issues.

c. Ensure that testing is performed by the approved laboratory.

d. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

e. Review project specific work plans (i.e. Cx, HAZMAT Abeatement, Stormwater Management) to ensure all preparatory work items have been completed and documented.

f. Coordinate scheduled work with special inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the statement of special inspections and the schedule of special inspections.

1.9.3 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary, until the completion of each DFOW and document in the daily CQC Report:

a. Ensure the work is in compliance with Contract requirements.

b. Maintain the quality of workmanship required.

c. Ensure that testing is performed by the approved laboratory.

d. Ensure that rework items are being corrected.

e. Assure manufacturers representatives have performed necessary inspections if required and perform safety inspections.

f. Review the Cx Plan and ensure all work items, testing, and documentation has been completed.

g. Coordinate scheduled work with special inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the statement of special inspections and the schedule of special inspections.

1.9.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW is resumed after substantial period of inactivity, or if other problems develop.

1.9.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

1.10 SUBMITTAL REVIEW AND APPROVAL

Procedures for submission, review and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES.

1.11 TESTING

Except as stated otherwise in the specification sections, perform sampling and testing required under this Contract.

1.11.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (E 329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing must meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

1.11.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at http://ts.nist.gov/ts/htdocs/210/214/214.htm , the American Association of State Highway and Transportation Officials (AASHTO) program at http://www.amrl.net/amrlsitefinity/default/aap.aspx , International Accreditation Services, Inc. (IAS) at http://www.iasonline.org, U. S. Army Corps of Engineers Materials Testing Center (MTC) at

http://gsl.erdc.usace.army.mil/SL/MTC/, the American Association for Laboratory Accreditation (A2LA) program at http://www.a2la.org/, the Washington Association of Building Officials (WABO) at http://www.wabo.org/ (Approval authority for WABO is limited to projects within Washington State), and the Washington Area Council of Engineering Laboratories (WACEL) at http://wacel.org/fmi/xsl/wacel/index.xsl (Approval authority by WACEL is limited to projects within Facilities Engineering Command (FEC) Washington geographical area).

1.11.3 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

1.11.4 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the Contracting Officer immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results must be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month, in accordance with paragraph INFORMATION FOR THE CONTRACTING OFFICER.

1.11.5 Test Reports and Monthly Summary Report of Tests

Furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the Contracting Officer. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month. Provide a copy of the signed test reports and certifications to the OMSI preparer for inclusion into the OMSI documentation.

1.12 QC CERTIFICATIONS

1.12.1 CQC Report Certification

Contain the following statement within the CQC Report: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report."

1.12.2 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current, coordinated and attesting that the work for which payment is requested, including stored material, is in compliance with Contract requirements.

1.12.3 Completion Certification

Upon completion of work under this Contract, the QC Manager must furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract." Provide a copy of this final QC Certification for completion to the OMSI preparer for inclusion into the OMSI documentation.

1.13 COMPLETION INSPECTIONS

1.13.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager and the CA must conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications and Contract. Include in the punch list any remaining items on the "Rework Items List", which were not corrected prior to the Punch-Out Inspection. Include within the punch list the estimated date by which the deficiencies will be corrected. Provide a copy of the punch list to the Contracting Officer. The QC Manager, or staff, must make follow-on inspections to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.13.2 Pre-Final Inspection

The Government and QCM will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" will be documented by the CQM as a result of this inspection. The QC Manager will ensure that all items on this list are corrected prior to notifying the Government that a "Final" inspection with the Client can be scheduled. Any items noted on the "Pre-Final" inspection must be corrected in a timely manner and be accomplished before the contract completion date for the work,or any particular increment thereof, if the project is divided into increments by separate completion dates.

1.13.3 Final Acceptance Inspection

Notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. State within the notice that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor must be represented by the QC Manager, the Project Superintendent, the CA, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other FEAD/ROICC personnel, and personnel representing the Client. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the Contract Clause entitled "Inspection of Construction."

1.14 DOCUMENTATION

Maintain current and complete records of on-site and off-site QC program operations and activities.

1.14.1 Construction Documentation

Reports are required for each day that work is performed and must be attached to the Contractor Quality Control Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities. The forms identified under the paragraph "INFORMATION FOR THE CONTRACTING OFFICER" will be used. Reports are required for each day work is performed. Account for each calendar day throughout the life of the Contract. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. The reporting of work must be identified by terminology consistent with the construction schedule. In the "remarks" sections of the reports, enter pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

1.14.2 Quality Control Validation

Establish and maintain the following in a series of three ring binders. Binders must be divided and tabbed as shown below. These binders must be readily available to the Contracting Officer during all business hours.

a. All completed Preparatory and Initial Phase Checklists, arranged by specification section.

b. All milestone inspections, arranged by Activity Number.

c. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section.

d. Copies of all contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.

e. An up-to-date copy of the Rework Items List.

f. Maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and Sub-Contractors and all punch lists issued by the Government.

g. Commissioning documentation including Cx checklists, schedules, tests, and reports.

h. Special inspection reports.

1.14.3 Testing Plan and Log

As tests are performed, the CA and the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month, per the paragraph "INFORMATION FOR THE CONTRACTING OFFICER". Provide a copy of the final "Testing Plan and Log" to the OMSI preparer

for inclusion into the OMSI documentation.

1.14.4 Rework Items List

The QC Manager must maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the "Rework Items List" to the last daily CQC Report of each month. The Contractor is responsible for including those items identified by the Contracting Officer.

1.14.5 As-Built Drawings

The QC Manager is required to ensure the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. Ensure each deviation has been identified with the appropriate modifying documentation (e.g. PC No., Modification No., Request for Information No., etc.). The QC Manager or QC Specialist assigned to an area of responsibility must initial each revision. Upon completion of work, the QC Manager will furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.15 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, is deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time for excess costs or damages by the Contractor.

1.16 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 days after Contract award or notice to proceed and not less than 10 days before the preconstruction meeting. Revise and resubmit Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants.

1.16.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with ASTM D6345. Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

1.16.1.1 Control Measures

Meet or exceed the requirements of ANSI/SMACNA 008, Chapter 3, to help minimize contamination of the building from construction activities. The

five requirements of this manual which must be adhered to are described below:

a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.

b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products must have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.

c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.

d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

1.16.1.2 Moisture Contamination

a. Remove accumulated water and keep work dry.

b. Use dehumidification to remove moist, humid air from a work area.

c. Do not use combustion heaters or generators inside the building.

d. Protect porous materials from exposure to moisture.

e. Remove and replace items which remain damp for more than a few hours.

1.16.2 Requirements after Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out must be a minimum two-weeks with MERV-13 filtration media as determined by ASHRAE 52.2at 100 percent outside air. Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or staining. Protect all materials and installations from damage by the activities of other trades.

-- End of Section --

SECTION 01 45 35

SPECIAL INSPECTIONS
02/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2012) International Building Code

1.2 GENERAL REQUIREMENTS

Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the prime contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.

1.3 DEFINITIONS

1.3.1 Continuous Special Inspections

Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.

1.3.2 Periodic Special Inspections

Periodic Special Inspections is Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed.

1.3.3 Perform

Perform these Special Inspections tasks for each welded joint or member.

1.3.4 Observe

Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections.

1.3.5 Special Inspector (SI)

A qualified person retained by the contractor and approved by the Contracting Officer as having the competence necessary to inspect a

particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.

1.3.6 Associate Special Inspector (ASI)

A qualified person who assists the SI in performing Special Inspections but must perform inspection under the direct supervision of the SI and cannot perform inspections without the SI on site.

1.3.7 Third Party

A third party inspector must not be company employee of the Contractor or any Sub-Contractor performing the work to be inspected.

1.3.8 Contracting Officer

The Government official having overall authority for administrative contracting actions. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR).

1.3.9 Contractor's Quality Control (QC) Manager

An individual retained by the prime contractor and qualified in accordance with the Section 01 45 00.00 20 QUALITY CONTROL having the overall responsibility for the contractor's QC organization.

1.3.10 Designer of Record (DOR)

A registered design professional contracted by the Government as an A/E responsible for the overall design and review of submittal documents prepared by others. The DOR is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in state in which the design professional works. The DOR is also referred to as the Engineer of Record (EOR) in design code documents.

1.3.11 Statement of Special Inspections (SSI)

A document developed by the DOR identifying the material, systems, components and work required to have Special Inspections.

1.3.12 Schedule of Special Inspections

A schedule which lists each of the required Special Inspections, the extent to which each Special Inspections is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Special Inspections Agency's Written Practices

SD-06 Test Reports

Special Inspections Daily Reports
Special Inspections Biweekly Reports

SD-07 Certificates

Special Inspector Qualifications; G

SD-11 Closeout Submittals

Comprehensive Final Report of Special Inspections; G

1.5 SPECIAL INSPECTOR QUALIFICATIONS

Submit qualifications for each special inspector.

Certifying Associations	
ACI	American Concrete Institute
AWCI	Association of the Wall and Ceiling Industry
AWS	American Welding Society
ICC	International Code Council
NICET	National Institute for Certification in Engineering Technologies
UL	Underwriters Laboratories

1.5.1 Steel Construction

1.5.1.1 Special Inspector

a. ICC Structural Steel Special Inspector certificate with one year of related experience, or

b. Registered Professional Engineer with related experience.

1.5.1.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.2 Welding Structural Steel

1.5.2.1 Special Inspector

a. ICC Structural Welding Special Inspector certificate with one year of related experience, or

b. AWS Certified Welding Inspector.

1.5.2.2 Associate Special Inspector

AWS Certified Associate Welding Inspector.

1.5.3 Concrete Construction

1.5.3.1 Special Inspector

a. ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or

b. ACI Concrete Construction Special Inspector, or

c. NICET Concrete Technician Level III Certificate in Construction Materials Testing, or

d. Registered Professional Engineer with related experience.

1.5.3.2 Associate Special Inspector

a. ACI Concrete Construction Special Inspector in Training, or

b. Engineer-In-Training with one year of related experience.

1.5.4 Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements

1.5.4.1 Special Inspector

a. ICC Soils Special Inspector Certificate with one year of related experience, or

b. NICET Soils Technician Level II Certificate in Construction Material Testing, or

c. NICET Geotechnical Engineering Technician Level II Construction or Generalist Certificate, or

d. Geologist-In-Training with one year of related experience, or

e. Registered Professional Engineer with related experience.

1.5.4.2 Associate Special Inspector

a. NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or

b. NICET Geotechnical Engineering Technician Level I Construction or Generalist Certificate with one year of related experience, or

c. Engineer-In-Training with one year of related experience.

1.5.5 Fire-Resistant Penetrations and Joints

1.5.5.1 Special Inspector

a. Passed the UL Firestop Exam with one year of related experience, or

b. Passed the FM Firestop Exam with one year of related experience, or

c. Registered Professional Engineer with related experience.

1.5.5.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

PART 2 PRODUCTS

2.1 FABRICATOR SPECIAL INSPECTIONS

Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Statement of Special Inspections and the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the following certification to the Contracting Officer for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.

a. American Institute of Steel Construction (AISC) Certified Fabrication Plant, Category STD.

At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special Inspections, stating that the materials supplied and work performed by the fabricator are in accordance the construction documents.

PART 3 EXECUTION

3.1 RESPONSIBILITIES

3.1.1 Quality Control Manager

a. Supervise all Special Inspectors required by the contract documents and the IBC.

b. Verify the qualifications of all of the Special Inspectors.

c. Verify the qualifications of fabricators.

d. Maintain a 3- ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the DOR.

e. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report.

3.1.2 Special Inspectors

a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.

b. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect.

c. Submit Special Inspections agency's written practices for the monitoring and control of the agency's operations to include the following:

1. The agency's procedures for the selection and administration of

inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.

2. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.

d. Submit a copy of the daily reports to the QC Manager.

e. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.

f. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:

1. A brief summary of the work performed during the reporting time frame.

2. Changes and/or discrepancies with the drawings, specifications that were observed during the reporting period.

3. Discrepancies which were resolved or corrected.

4. A list of nonconforming items requiring resolution.

5. All applicable test result including nondestructive testing reports.

g. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Contracting Officer to accept such work.

-- End of Section --

Statement of Special Inspections & Schedule of Special Inspections

Renovation of NGIS, Building 678, Coddington Point, Newport Naval Station, RI

Prepared by:

Burns & McDonnell
1305 Executive Blvd, Suite 160
Chesapeake, VA 23320

May 5, 2016
Final Submittal

STATEMENT OF SPECIAL INSPECTIONS

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE:

David E. Sellars, P.E.

This Statement of Special Inspections was prepared in accordance with Section 1704.3 of the 2012 International Building Code and UFC 3-301-01. Specification Section 01 45 35 defines the qualification requirements and responsibilities for the various inspection and testing agents, report submittal requirements, discrepancy tracking procedures and other procedures necessary to execute the special inspections program. The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

This Statement of Special Inspections includes a *Schedule of Special Inspections* attached herein that defines the following:

- Materials, systems, components and work required to have special inspection or testing
- Type and extent of each special inspection
- Type and extent of each test
- Additional requirements for special inspection or testing for seismic or wind resistance where required
- Identification as to whether special inspection is continuous or periodic for each type of special inspection

The *Schedule of Special Inspections* identifies the following elements of the buildings and structures for this project that require verification and inspection in accordance with IBC 2012 Section 1705.

☒ Steel Construction
☐ Steel Construction other than Structural Steel
☒ Concrete Construction
☐ Masonry Construction: ☐ Level B ☐ Level C
☐ Wood Construction
☒ Soils
☐ Driven Deep Foundations
☐ Cast-In-Place Deep Foundations
☐ Helical Pile Foundations
☐ Special Inspections for Wind Resistance
☐ Special Inspections for Seismic Resistance
☐ Testing and Qualifications for Seismic Resistance
☐ Sprayed Fire-Resistant Materials (SFRM)
☐ Mastic and Intumescent Fire Resistant Coatings
☐ Exterior Insulation and Finish Systems (EIFS)
☒ Fire-Resistant Penetrations and Joints
☐ Smoke Control
☐ Architectural Components
☐ Mechanical and Electrical Components
☐ Seismically Isolated Structure

Contractor Statement of Responsibility (IBC Section 1704.4)
Where the contractor statement of responsibility is required, each contractor responsible for the construction of a main wind- or seismic force-resisting system, designated seismic system, or a wind- or seismic-resisting component listed in the *Statement of Special Inspections* shall submit a *Contractor Statement of Responsibility* to the Contracting Officer prior to the commencement of work on the system or component.

Contractor Statement of Responsibility
☐ is required for this project.
☒ is not required for this project.

Structural Observations (IBC Section 1704.5)
Where structural observations are required, they will be performed by the structural Designer of Record or their designated representative. The frequency and extent of structural observations is defined in project specification 01 45 35 SPECIAL INSPECTIONS.

Structural Observations for Wind Requirements
☐ are required for this project.
☒ are not required for this project.

Structural Observations for Seismic Resistance
☐ are required for this project.
☒ are not required for this project.

Seismic Force Resisting System(s) (IBC Section 1704.3.2)
The following is a description of the seismic force resisting structural system(s) that are subject to special inspections: n/a

Main Wind Force Resisting System(s) and Components (IBC Section 1704.3.3)
The following is a description of the main wind force resisting structural system(s) and components that are subject to special inspections: n/a

Designated Non-Structural Seismic Systems Subject to Special Inspections
Following are lists of designated seismic systems that are subject to special inspection requirements as defined in the *Schedule of Special Inspections.*

Architectural Designated Seismic Systems
Following is a list of the architectural designated seismic systems that are in or attached to a Risk Category IV or V structure and are needed for continued operation of the facility or their failure could impair the continued operation of the facility: n/a

Mechanical Designated Seismic Systems
Following is a list of mechanical designated seismic systems for Seismic Design Category C or higher or Risk Category V:

- Heating, ventilation and air-conditioning (HVAC) ductwork containing hazardous materials and anchorage of such ductwork: n/a
- Piping systems and mechanical units containing flammable, combustible or highly toxic materials: n/a

Following is a list of mechanical designated seismic systems for Seismic Design Category D or higher or Risk Category V:

- Life safety components required to function after earthquake: n/a
- Components that contain hazardous content: n/a
- Components in an essential facility needed for continued operation after an earthquake: n/a

Electrical Designated Seismic Systems
Following is a list of electrical designated seismic systems for Seismic Design Category C or higher or Risk Category V:

- Anchorage of electrical equipment used for emergency or standby power systems: n/a

Following is a list of electrical designated seismic systems for Seismic Design Category D or higher or Risk Category V:

- Life safety component required to function after an earthquake: n/a
- Components that contain hazardous content: n/a
- Components in an essential facility needed for continued operation after an earthquake: n/a

Periodic Walk-Down Inspections

Following is a list of periodic walk-down inspections required by UFC 3-301-01: n/a

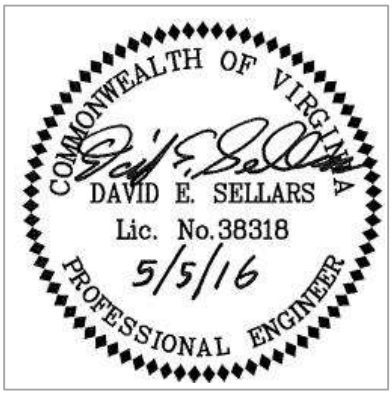
Progressive Collapse Resistance System

Following is a list of elements that are part of the progressive collapse résistance system that require special inspections:

- Elements of the tie force system consisting of internal longitudinal and transverse, vertical and peripheral ties: n/a
- Elements of the alternate path system: n/a
- Elements having enhanced local resistance: n/a

David E. Sellars, P.E.
Registered Design Professional in Responsible Charge

5/5/16
Date



Signature & Seal of
Registered Design Professional
in Responsible Charge

SCHEDULE OF SPECIAL INSPECTIONS

P – Perform these Special Inspections tasks for each welded joint or member. (AISC 360 & AISC 341)

O – Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections. (AISC 360 & AISC 341)

D – Document, with a report, that the work has been performed in accordance with the contract documents. (AISC 341)

C – Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks. (IBC)

P – Periodic Special Inspections is Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed. (IBC)

STEEL CONSTRUCTION

PRIOR TO WELDING (Table N5.4-1, AISC 360-10 & TABLE J6-1, AISC 341-10)				
Required	Task	Perform	Observe	Description
☒	1. Verify welding procedures (WPS) and consumable certificates	P	-	
☒	2. Material identification (Type/Grade)	-	O	
☒	3. Welder identification system	-	O	A system shall be maintained by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress dye type.
☐	4. Fit-up groove welds (including joint geometry)	-	O	• Joint preparation • Dimensions (alignment, root opening, root face, bevel) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location) • Backing type and fit (if applicable)
☐	5. Configuration and finish of access holes	-	O	
☒	6. Fit-up of fillet welds	-	O	• Dimensions (alignment, gaps at root) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location)

STEEL CONSTRUCTION

DURING WELDING (Table N5.4-2, AISC 360-10 & TABLE J6-2, AISC 341-10)				
Required	Task	Perform	Observe	Description
☒	1. Use of qualified welders	-	O	
☒	2. Control and handling of welding consumables	-	O	• Packaging • Exposure control.
☒	3. No welding over cracked tack welds	-	O	
☒	4. Environmental conditions	-	O	• Wind speed within limits • Precipitation and temperature
☒	5. WPS followed	-	O	• Settings on welding equipment • Travel speed • Selected welding materials • Shielding gas type/flow rate • Preheat applied • Interpass temperature maintained (min./max.) • Proper position (F, V, H, OH) • Intermix of filler metals avoided unless approved
☒	6. Welding techniques	-	O	• Interpass and final cleaning • Each pass within profile limitations • Each pass meets quality requirements

STEEL CONSTRUCTION

AFTER WELDING (TABLE N5.4-3, AISC 360-10 & TABLE J6-3, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	1. Welds cleaned	-	O	
☒	2. Size, length, and location of welds	P	-	
☒	3. Welds meet visual acceptance criteria	P	-	• Crack prohibition • Weld/base-metal fusion • Crater cross section • Weld profiles • Weld size • Undercut • Porosity
☒	4. Arc strikes	P	-	
☒	5. k-area	P	-	When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. of the weld.
☒	6. Backing removed and weld tabs removed (if required)	P	-	
☒	7. Backing removed, weld tabs removed and finished, and fillet welds added (if required)	P/D	-	
☒	8. Placement of reinforcing or contouring fillet welds (if required)	P/D	-	
☒	9. Repair activities	P	-	
☒	10. Document acceptance or rejection of welded joint/member	P	-	

STEEL CONSTRUCTION

NONDESTRUCTIVE TESTING (SECTION N5.5, AISC 360-10 & SECTION J6.2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. CJP welds (Risk Cat. II)	-	O	Ultrasonic testing shall be performed on 10% of CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading in materials 5/16-inch thick or greater. Testing rate must be increased if > 5% of welds tested have unacceptable defects.
☐	2. CJP welds (Risk Cat. III, IV or V)	-	O	Ultrasonic testing shall be performed on all CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading in materials 5/16-inch thick or greater.
☐	3. CJP welds	-	O	Ultrasonic testing shall be performed on 100% of CJP groove welds in materials 5/16-inch or greater. Magnetic particle testing shall be performed on 25% of all beam-to-column CJP groove welds.
☐	4. Access holes (flange > 2”)	-	O	Thermally cut surfaces of access holes shall be MT or PT when the flange thickness exceeds 2 in. for rolled shapes, or when the web thickness exceeds 2 in. for built-up shapes. Any cracks shall be deemed unacceptable regardless of size or location.
☐	5. Welded joints subject to fatigue	-	O	Radiographic or Ultrasonically inspect welded joints identified on the contract documents to be subject to fatigue per sections 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, and 6.3 of Table A-3.1, AISC 360-10.

STEEL CONSTRUCTION

NONDESTRUCTIVE TESTING (SECTION N5.5, AISC 360-10 & SECTION J6.2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	6. K-area NDT	P	-	Where welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, the web shall be tested for cracks using magnetic particle testing (MT). The MT inspection area shall include the k-area base metal within 3-inches of the weld. The MT shall be performed no sooner than 48 hours following completion of the welding.
☐	7. Base metal NDT for lamellar tearing and laminations	-	O	After joint completion, base metal thicker than 1 1/2 in. loaded in tension in the through-thickness direction in tee and corner joints, where the connected material is greater than 3/4 in. and contains CJP groove welds, shall be ultrasonically tested for discontinuities behind and adjacent to the fusion line of such welds.
☐	8. Beam cope and access hole	-	O	At welded splices and connections, thermally cut surfaces of beam copes and access holes shall be tested using magnetic particle testing or penetrant testing, when the flange thickness exceeds 1 1/2 in. for rolled shapes, or when the web thickness exceeds 1 1/2 in. for built-up shapes.
☐	9. Reduced beam section repair	-	O	Magnetic particle testing shall be performed on any weld and adjacent area of the reduced beam section (RBS) cut surface that has been repaired by welding, or on the base metal of the RBS cut surface if a sharp notch has been removed by grinding.
☐	10. Weld tab removal sites	-	O	At the end of welds where weld tabs have been removed, magnetic particle testing shall be performed on the same beam-to-column joints receiving UT.

STEEL CONSTRUCTION

PRIOR TO BOLTING (TABLE N5.6-1, AISC 360-10 & TABLE J7-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Manufacture's certification available for fastener materials	P	-	
☐	2. Fasteners marked in accordance with ASTM requirements	-	O	
☐	3. Proper fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane	-	O	
☐	4. Proper bolting procedure selected for joint detail	-	O	
☐	5. Connecting elements, including appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	-	O	
☐	6. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	-	O	
☐	7. Proper storage provided for bolts, nuts, washers, and other fastener components	-	O	

STEEL CONSTRUCTION

DURING BOLTING (TABLE N5.6-2, AISC 360-10 & TABLE J7-2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Fastener assemblies of suitable condition, paced in all holes and washers (if required) are positioned as required	-	O	
☐	2. Joint brought to the snug-tight condition prior to pretensioning operations	-	O	
☐	3. Fastener component not turned by the wrench prevented from rotating	-	O	
☐	4. Fasteners are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges	-	O	
AFTER BOLTING (TABLE N5.6-3, AISC 360-10 & TABLE J7-3, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	Document acceptance or rejection of bolted connections	P	-	
OTHER STEEL INSPECTIONS (SECTION N5.7, AISC 360-10):				
Required	Task	Perform	Observe	Description
☒	1. Anchor rods and other embedments supporting structural steel	P	-	Verify the diameter, grade, type, and length of the anchor rod or embedded item, and the extent or depth of embedment prior to placement of concrete.
☒	2. Fabricated steel or erected steel frame	-	O	Verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations and proper application of joint details at each connection.

STEEL CONSTRUCTION

OTHER STEEL INSPECTIONS (Tables J8-1 & J10-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Reduced beam sections (RBS)	P/D	-	• Contour and finish • Dimensional tolerances
☐	2. Protected zones	P/D	-	No holes or unapproved attachments made by fabricator or erector
☐	3. H-piles	P/D	-	No holes or unapproved attachments made by the responsible contractor
STEEL ELEMENTS OF COMPOSITE CONSTRUCTION PRIOR TO CONCRETE PLACEMENT (TABLE N6.1, AISC 360-10):				
Required	Task	Perform	Observe	Description
☐	1. Placement and installation of steel deck	P	-	
☐	2. Placement and installation of steel headed stud anchors	P	-	
☐	3. Document acceptance or rejection of steel elements	P	-	
COMPOSITE STRUCTURES PRIOR TO CONCRETE PLACEMENT (TABLE J9-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Material identification of reinforcing steel (Type/Grade)	-	O	
☐	2. Determination of carbon equivalent for reinforcing steel other than ASTM A706	-	O	
☐	3. Proper reinforcing steel size, spacing and orientation	-	O	
☐	4. Reinforcing steel has not been rebent in the field	-	O	
☐	5. Reinforcing steel has been tied and supported as required	-	O	
☐	6. Required reinforcing steel clearances have been provided	-	O	
☐	7. Composite member has required size	-	O	

STEEL CONSTRUCTION

COMPOSITE STRUCTURES DURING CONCRETE PLACEMENT (TABLE J9-2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Concrete: Material identification (mix design, compressive strength, maximum large aggregate size, maximum slump)	-	O/D	
☐	2. Limits on water added at the truck or pump	-	O/D	
☐	3. Proper placement techniques to limit segregation	-	O	

STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL

STEEL ROOF AND FLOOR DECKS (IBC TABLE 1705.2.2):				
Required	Task	Continuous	Periodic	Description
☐	1. Material verification of cold-formed steel deck	-	P	Confirm that identification markings are provided to conform to ASTM standards specified on approved construction documents. Verify material with manufacturer's certified test reports.
☐	2. Floor and roof deck welds	-	P	Visual inspection to confirm that welds meet acceptance criteria of AWS D1.3 and verify welder qualifications.
WELDING OF REINFORCING STEEL (IBC TABLE 1705.2.2):				
Required	Task	Continuous	Periodic	Description
☐	1. Verification of weldability	-	P	Verify weldability of reinforcing steel, other than ASTM A 706 based upon carbon equivalent and in accordance with AWS D1.4.
☐	2. Reinforcing steel resisting flexural and axial forces in intermediate or special moment fames, and boundary elements of special structural walls	C	-	Visually inspect all welds in accordance with AWS D1.4.
☐	3. Shear reinforcement	C	-	Visually inspect all welds in accordance with AWS D1.4.
☐	4. Other reinforcing steel	-	P	Visually inspect all welds in accordance with AWS D1.4.

STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL

COLD FORMED STEEL (IBC 1705.2.2, 1705.10, 1705.11):				
Required	Task	Continuous	Periodic	Description
☐	1. Trusses spanning 60-feet or greater	-	P	Verify that temporary and permanent truss bracing is installed in accordance with approved truss package.
☐	2. Cold-formed steel light-frame construction welded connections	-	P	Visually inspect all welds within the main wind force or seismic force resisting system in accordance with AWS D1.4.
☐	3. Cold-formed steel light-frame construction mechanical connections	-	P	Visually inspect all screw attachment, bolting, anchoring and other fastening of components within the main wind force or seismic force resisting system including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.
☐	4. Cold-formed steel connections	-	P	Verify proper welding operations, screw attachment, bolting, anchoring and other fastening of components within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements.

CONCRETE CONSTRUCTION

IBC TABLE 1705.3, 1705.12.1:				
Required	Task	Continuous	Periodic	Description
☒	1. Reinforcing steel, including prestressing tendons	-	P	Verify prior to placing concrete that reinforcing is of specified type, grade and size; that it is free of oil, dirt and rust; that it is located and spaced properly; that hooks, bends, ties, stirrups and supplemental reinforcement are placed correctly; that lap lengths, stagger and offsets are provided; and that all mechanical connections are installed per the manufacturer's instructions and/or evaluation report.
☒	2. Anchors cast in concrete	-	P	Verify prior to placing concrete that cast in anchors have proper embedment, spacing and edge distance.
☒	3. Post-installed anchors or dowels	-	P	Inspect all post-installed anchors/dowels as required by the approved ICC-ES report.
☒	4. Use of required mix design	-	P	Verify that all mixes used comply with the approved construction documents
☒	5. Concrete slump, air content, and temperature	C	-	At the time fresh concrete is sampled to fabricate specimens for strength test verify these tests are performed.
☒	6. Concrete & shotcrete placement	C	-	Verify proper application techniques are used during concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
☒	7. Curing temperature and techniques	-	P	Inspect curing , cold weather protection and hot weather protection procedures.
☐	8. Pre-stressed concrete	C	-	Verify application of prestressing forces and grouting of bonded prestressing tendons in the seismic force-resisting system.

CONCRETE CONSTRUCTION

IBC TABLE 1705.3, 1705.12.1:				
Required	Task	Continuous	Periodic	Description
☐	9. Erection of precast concrete	-	P	Verify that all precast elements are lifted, assembled and braced in accordance with the approved construction documents.
☐	10. In-situ concrete strength verification	-	P	Prior to the removal of shores and forms or the stressing of post-tensioned tendons verify that adequate strength has been achieved.
☒	11. Formwork	-	P	Inspect the forms to ensure that they are placed plumb and conform to the shapes, lines, and dimensions of the members as required by the approved construction documents.
☐	12. Reinforcement complying with ASTM A 615 in special moment frames, special structural walls and coupling beams	-	P	Verify that ASTM A 615 reinforcing steel used in these areas complies with ACI 318: 21.1.5.2 by means of certified mill test reports. If this reinforcing steel is to be welded chemical tests shall be performed in accordance with ACI 318: 3.5.2.
☐	13. Reinforcement placement within progressive collapse resisting system	C	-	Visual inspect reinforcing steel placement with a particular emphasis on reinforcing steel anchorages, laps and other details within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements.

MASONRY CONSTRUCTION – LEVEL B

PRIOR TO CONSTRUCTION (SPEC ARTICLE 1.5, TMS-602/ACI 530.1-11):				
Required	Task	Continuous	Periodic	Description
☐	Review material certificates, mix designs, test results and construction procedures	-	P	Verify that materials conform to the requirements of the approved construction documents.
AS CONSTRUCTION BEGINS (TABLE 1.19.2, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Proportions of site-prepared mortar	-	P	Verify that mortar is of the type and color specified on the construction documents, that it conforms to ASTM C 270, and that it is mixed in accordance with Article 2.6 A of TMS-602/ACI 530.1.
☐	2. Construction of mortar joints	-	P	Verify that mortar joints comply with Article 3.3 B of TMS-602/ACI 530.1.
☐	3. Grade and size of prestressing tendons and anchorages	-	P	Verify that prestressing tendons comply with Article 2.4 B of TMS-602/ACI 530.1 and that anchorages, couplers, and end blocks comply with Article 2.4 H.
☐	4. Location of reinforcement, connectors, and prestressing tendons and anchorages	-	P	Verify that reinforcement is placed in accordance with Article 3.4 of TMS-602/ACI 530.1. Prestressing tendons shall be placed per Article 3.6 A.
☐	5. Prestressing technique	-	P	Verify that prestressing technique complies with Article 3.6 B of TMS-602/ACI 530.1.
☐	6. Properties of thin-bed mortar for AAC masonry	C	P	Verify that mortar complies with Article 2.1 C of TMS-602/ACI 530.1. Continuous inspection for the first 5000 square feet of wall and periodic for all following applications.

MASONRY CONSTRUCTION – LEVEL B

PRIOR TO GROUTING (TABLE 1.19.2, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Grout space	-	P	Verify that grout space is free of mortar droppings, debris, loose aggregate, and other deleterious materials and that cleanouts are provided per Article 3.2 D and 3.2 F of TMS-602/ACI 530.1.
☐	2. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages	-	P	Verify that reinforcement, joint reinforcement, wall ties, anchor bolts and veneer anchors comply with the approved construction documents and Section 1.16 of TMS 402/ACI 530.
☐	3. Placement of reinforcement, connectors, and prestressing tendons and anchorages	-	P	Verify that reinforcement, joint reinforcement, wall ties, anchor bolts and veneer anchors are installed in accordance with the approved construction documents and Articles 3.2 E, 3.4, and 3.6 A of TMS 602/ACI 530.1.
☐	4. Proportions of site-prepared grout and prestressing grout for bonded tendons	-	P	Verify that grout is proportioned per ASTM C 476 and has a slump between 8-11 inches. Self-consolidated grout shall not be proportioned onsite.
☐	5. Construction of mortar joints	-	P	Verify that mortar joints are placed in accordance with Article 3.3 B of TMS 602/ACI 530.1.

MASONRY CONSTRUCTION – LEVEL B

DURING MASONRY CONSTRUCTION (TABLE 1.19.2, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Size and location of structural elements	-	P	Verify the locations of structural elements with respect to the approved plans and confirm that tolerances meet the requirements of Article 3.3 F of TMS 602/ACI 530.1.
☐	2. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.	-	P	Verify that correct anchorages and connections are provided per the approved plans and Sections 1.16.4.3 and 1.17.1 of TMS 402/ACI 530.
☐	3. Welding of reinforcement	C	-	Verify welded reinforcement meet the requirements of Section 2.1.7.7.2, 3.3.3.4(c), and 8.3.3.4(b) of TMS 402/ACI 530.
☐	4. Preparation, construction, and protection of masonry during cold weather (<40°F) or hot weather (>90°F).	-	P	Verify that cold-weather construction is performed in accordance with Article 1.8 C of TMS 602/ACI 530.1 and hot weather construction per Article 1.8 D of TMS 602/ACI 530.1.
☐	5. Application and measurement of prestressing force	C	-	Verify the proper prestressting force is applied per Article 3.6 B of TMS 602/ACI 530.1.
☐	6. Placement of grout and prestressing grout for bonded tendons is in compliance	C	-	Verify placement of grout is done in accordance with Article 3.5 of TMS 602/ACI 530.1 and placement of grout for bonded tendons is in accordance with Article 3.6 C of TMS 602/ACI 530.1.
☐	7. Placement of AAC masonry units and construction of thin-bed mortar joints	C	P	Verify that mortar is placed in accordance with Article 3.3 B.8 of TMS-602/ACI 530.1. Continuous inspection for the first 5000 square feet of wall and periodic for all following applications.
☐	8. Observation of grout specimens, mortar specimens, and/or prisms	-	P	Confirm that specimens/prisms are performed as required by Article 1.4 of TMS-602/ACI 530.1.

MASONRY CONSTRUCTION – LEVEL B

MINIMUM TESTING (TABLE 1.19.2, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Verification of Slump Flow and Visual Stability Index (VSI) for self-consolidating grout	-	-	Compressive strength tests should be performed in accordance with ASTM C 1019 for slump flow and ASTM C 1611 for VSI.
☐	2. Verification of f'm and f'AAC	-	-	Determine the compressive strength for each wythe by the "unit strength method" or by the "prism test method" as specified in Article 1.4 B of TMS 602/ACI 530.1 prior to construction.

MASONRY CONSTRUCTION – LEVEL C

PRIOR TO CONSTRUCTION (ARTICLE 1.5, TMS-602/ACI 530.1-11):				
Required	Task	Continuous	Periodic	Description
☐	Review material certificates, mix designs, test results and construction procedures	-	P	Verify that materials conform to the requirements of the approved construction documents.
AS CONSTRUCTION BEGINS (TABLE 1.19.3, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Proportions of site-mixed mortar	-	P	Verify that mortar is of the type and color specified on the construction documents, that it conforms to ASTM C 270, and that it is mixed in accordance with Article 2.6 A of TMS-602/ACI 530.1.
☐	2. Placement of masonry units & construction of mortar joints	-	P	Verify that mortar joints comply with Article 3.3 B of TMS-602/ACI 530.1.
☐	3. Properties of thin-bed mortar for AAC masonry	C	-	Verify that mortar complies with Article 2.1 C of TMS-602/ACI 530.1.
PRIOR TO GROUTING (TABLE 1.19.3, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Grout space prior to grouting	C	-	Verify that grout space is free of mortar droppings, debris, loose aggregate, and other deleterious materials and that cleanouts are provided per Article 3.2 D and 3.2 F of TMS-602/ACI 530.1.
☐	2. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages	-	P	Verify that reinforcement, joint reinforcement, wall ties, anchor bolts and veneer anchors comply with the approved construction documents and Section 1.16 of TMS 402/ACI 530.
☐	3. Proportions of site-mixed grout and prestressing grout for bonded tendons	-	P	Verify that grout is proportioned per ASTM C 476 and has a slump between 8-11 inches. Self-consolidated grout shall not be proportioned onsite.
☐	4. Placement of reinforcement, connectors, and prestressing tendons and anchorages	C	-	Verify that reinforcement, joint reinforcement, wall ties, anchor bolts and veneer anchors are installed in accordance with the approved construction documents and Articles 3.2 E, 3.4, and 3.6 A of TMS 602/ACI 530.1.

MASONRY CONSTRUCTION – LEVEL C

DURING MASONRY CONSTRUCTION (TABLE 1.19.3, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Size and location of structural elements	-	P	Verify the locations of structural elements with respect to the approved plans and confirm that tolerances meet the requirements of Article 3.3 F of TMS 602/ACI 530.1-11.
☐	2. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.	C	-	Verify that correct anchorages and connections are provided per the approved plans and Sections 1.16.4.3 and 1.17.1 of TMS 402/ACI 530-11.
☐	3. Welding of reinforcement	C	-	Verify welded reinforcement meet the requirements of Section 2.1.7.7.2, 3.3.3.4(c), and 8.3.3.4(b) of TMS 402/ACI 530.
☐	4. Preparation, construction, and protection of masonry during cold weather (<40°F) or hot weather (>90°F).	-	P	Verify that cold-weather construction is performed in accordance with Article 1.8 C of TMS 602/ACI 530.1 and hot weather construction per Article 1.8 D of TMS 602/ACI 530.1.
☐	5. Application and measurement of prestressing force	C	-	Verify the proper prestressting force is applied per Article 3.6 B of TMS 602/ACI 530.1.
☐	6. Placement of grout and prestressing grout for bonded tendons is in compliance	C	-	Verify placement of grout is done in accordance with Article 3.5 of TMS 602/ACI 530.1 and placement of grout for bonded tendons is in accordance with Article 3.6 C of TMS 602/ACI 530.1.
☐	7. Placement of AAC masonry units and construction of thin-bed mortar joints	C	-	Verify that mortar is placed in accordance with Article 3.3 B.8 of TMS-602/ACI 530.1-11.
☐	8. Observation of grout specimens, mortar specimens, and/or prisms	C	-	Confirm that specimens/prisms are performed as required by Article 1.4 of TMS-602/ACI 530.1-11.

MASONRY CONSTRUCTION – LEVEL C

MINIMUM TESTING (TABLE 1.19.3, TMS-402/ACI 530-11):				
Required	Task	Continuous	Periodic	Description
☐	1. Verification of Slump Flow and Visual Stability Index (VSI) for self-consolidating grout	-	-	Compressive strength tests should be performed in accordance with ASTM C 1019 for slump flow and ASTM C 1611 for VSI.
☐	2. Verification of f'm and f'AAC	-	-	Determine the compressive strength for each wythe by the "unit strength method" or by the "prism test method" as specified in Article 1.4 B of TMS 602/ACI 530.1 prior to construction and every 5000 square feet during construction.
☐	3. Verification of proportions of materials in premixed or pre-blended mortar and grout	-	-	Verify that proportions for mortar meet ASTM C 270 and proportions for grout meet ASTM C 476.

WOOD CONSTRUCTION

IBC 1705.5, 1705.10.1 & 1705.11.2				
Required	Task	Continuous	Periodic	Description
☐	1. High-load diaphragms	-	P	Verify thickness and grade of sheathing, size of framing members at panel edges, nail/staple diameters and length, and the number of fastener lines and fastener spacing are per approved plans.
☐	2. Metal-plate-connected wood trusses spanning 60 feet or greater	-	P	Verify that temporary and permanent truss bracing is installed in accordance with approved truss package.
☐	3. Field Gluing	C	-	Inspect all field gluing of structural wood element within the main wind-force resisting system.
☐	4. Nailing, bolting, anchoring and other fastening of components	-	P	If fasteners within the main wind-force resisting system are spaced less than 4-inches, verify that proper nailing, bolting, anchoring and other fastening of shear walls, diaphragms, drag struts, braces, and holdowns.
☐	5. Nailing, bolting, anchoring and other fastening of components	-	P	Verify proper nailing, bolting, anchoring, and other fastening components within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements.

SOILS

IBC TABLE 1705.6				
Required	Task	Continuous	Periodic	Description
☒	1. Foundation bearing capacity	-	P	Verify the materials below foundations are adequate to achieve the design bearing capacity.
☒	2. Excavations	-	P	Verify the excavations are extended to the proper depth and have reached proper material.
☒	3. Perform classification and testing of compacted fill materials	-	P	
☒	4. Compacted fill material	C	-	Verify the use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.
☒	5. Subgrade	-	P	Prior to placement of compacted fill, observe sub-grade and verify that site has been prepared properly.

DRIVEN DEEP FOUNDATIONS

IBC TABLE 1705.7				
Required	Task	Continuous	Periodic	Description
☐	1. Verify element materials, sizes and lengths comply with the construction documents	C	-	
☐	2. Determine capacities of test elements and conduct necessary load tests, as required	C	-	
☐	3. Observe drilling operations and maintain complete and accurate records for each element	C	-	
☐	4. Verify placement locations & plumbness, confirm type & size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	C	-	
☐	5. Steel piles	-	-	Inspect per STRUCTURAL STEEL schedule
☐	6. Concrete elements and concrete-filled elements.	-	-	Inspect per CONCRETE CONSTRUCTION schedule
☐	7. Specialty piles	-	-	Perform additional inspection as determined by the DOR.

CAST-IN-PLACE DEEP FOUNDATIONS

IBC TABLE 1705.8				
Required	Task	Continuous	Periodic	Description
☐	1. Observe drilling operations and maintain complete and accurate records for each element	C	-	
☐	2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes.	C	-	
☐	3. Perform additional inspections for concrete elements.	-	-	Inspect per CONCRETE CONSTRUCTION schedule

HELICAL PILE FOUNDATIONS

IBC 1705.9				
Required	Task	Continuous	Periodic	Description
☐	Record installation equipment used, pile dimensions, tip elevations, final depth, and final installation torque	C	-	

SPRAYED FIRE-RESISTANT MATERIALS (SFRM)

IBC 1705.13				
Required	Task	Continuous	Periodic	Description
☐	1. Surface condition	-	P	Prior to application confirm that surface has been prepared per the approved fire-resistance design and manufacturer's instructions.
☐	2. Application	-	P	Prior to application confirm that the substrate meets the minimum ambient temperature per the approved fire-resistance design and manufacturer's instructions.
☐	3. Material thickness	-	P	Verify that the thickness of the SFRM to structural elements is not less than the thickness require by the fire-resistant design in more than 10 percent of the measurement, but in no case less than minimum allowable thickness required by 1705.13.4.1.
☐	4. Material density	-	P	Verify that the density of the SFRM to structural elements is not less than the density specified in the fire-resistant design.
☐	5. Bond strength	-	P	Verify cohesive/adhesive bond strength of the cured SFRM applied to the structural elements is not less than 150 psf.

MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS

IBC 1705.14				
Required	Task	Continuous	Periodic	Description
☐	1. Surface preparation	-	P	Prior to application confirm that surface temperature and substrate are acceptable in accordance with AWCI 12-B.
☐	2. Thickness	-	P	Final thickness of coating must be verified in multiple locations prior to applying top coat per AWCI 12-B.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)

IBC 1705.15				
Required	Task	Continuous	Periodic	Description
☐	Material and installation	C	-	Verify that water-resistive barrier, complying with ASTM E 2570, is installed appropriately over a sheathing substrate.

FIRE-RESISTANT PENETRATIONS AND JOINTS

IBC 1705.16				
Required	Task	Continuous	Periodic	Description
☒	1. Penetration firestops	-	P	Listed systems shall be inspected in accordance with ASTM E 2174.
☒	2. Fire-resistant joint systems	-	P	Listed systems shall be inspected in accordance with ASTM E 2393.

SMOKE CONTROL

IBC 1705.17				
Required	Task	Continuous	Periodic	Description
☐	1. Verify device locations and perform leakage testing	-	P	Perform during erection of ductwork and prior to concealment.
☐	2. Pressure difference testing, flow measurements and detection and control verification	-	P	Perform prior to occupancy and after sufficient completion.

ARCHITECTURAL COMPONENTS

IBC 1705.10.3, 1705.11.5 & 1705.11.7				
Required	Task	Continuous	Periodic	Description
☐	1. Roof and wall cladding	-	P	Verify appropriate materials, fasteners and attachment at commencement of work and at completion.
☐	2. Erection and fastening of exterior cladding or interior and exterior veneers	-	P	Verify appropriate materials, fasteners and attachment at commencement of work and at completion. (Not required if height is less than 30 feet or weight is less than 5psf).
☐	3. Erection and fastening of interior and exterior nonbearing walls	-	P	Verify appropriate materials, fasteners and attachment at commencement of work and at completion. (Not required if height is less than 30 feet or weight is less than 15psf).
☐	4. Access floors	-	P	Verify that anchorage complies with approved construction documents. Inspection of post-installed anchors shall comply with approved ICC-ES report.
☐	5. Storage racks	-	P	Verify that anchorage complies with approved construction documents. Inspection of post-installed anchors shall comply with approved ICC-ES report.

MECHANICAL AND ELECTRICAL COMPONENTS

IBC 1705.11.4, 1705.11.6 & 1705.12.3 and UFC 3-301-01				
Required	Task	Continuous	Periodic	Description
☐	1. Anchorage of emergency or standby power systems	-	P	Verify that anchorage complies with approved construction documents.
☐	2. Anchorage of electrical equipment not part of emergency or standby power systems	–	P	Verify that anchorage complies with approved construction documents.
☐	3. Installation of piping systems carrying hazardous materials and their associated mechanical units	-	P	Verify that installation and restraint comply with approved construction documents.
☐	4. Installation of HVAC ductwork containing hazardous materials	-	P	Verify that installation and restraint comply with approved construction documents.
☐	5. Installation of vibration isolation systems having a clearance of less than 1/4 inch between the equipment support frame and restraint	-	P	Verify that installation complies with approved construction documents and manufacturer's recommendations.
☐	6. Designated seismic systems	-	P	Confirm that manufacturer's certificate of compliance conforms to the requirements of Section 13.2 of ASCE 7. Verify that the label, anchorage or mounting conforms to the manufacturer's certificate of compliance.
☐	7. Designated seismic system equipment verification	-	P	• Verify model number and serial number are in conformance with the Project Specific Seismic Qualification (PSSQ). • Verify Tag ID is correct and installed per specifications.
☐	8. Designated seismic system equipment mounting	-	P	• Verify that anchor base bolting is installed per PSSQ. • Verify that equipment bracing is installed per PSSQ. • Verify that bracing attachments are installed per PSSQ.

MECHANICAL AND ELECTRICAL COMPONENTS

IBC 1705.11.4, 1705.11.6 & 1705.12.3 and UFC 3-301-01				
Required	Task	Continuous	Periodic	Description
☐	9. Designated seismic system utility conduit/piping	-	P	• Verify that conduit/piping is connected to the equipment per PSSQ (flex or rigid) • Verify that conduit/piping is seismically supported independently of equipment and in accordance with PSSQ support requirements.
☐	10. Designated seismic system clearance	-	P	• Adjacent equipment – Verify that there is adequate gap to eliminate the possibility of pounding. • Conduit/piping – Verify that there is adequate gap to eliminate possibility of pounding.

SEISMICALLY ISOLATED STRUCTURES

IBC 1705.11.8				
Required	Task	Continuous	Periodic	Description
☐	Fabrication and installation	-	P	Verify that fabrication and installation of isolator units and energy dissipation devices conform to manufacturer's recommendations and approved construction documents.

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
08/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511	(2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(10th Edition) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2013; Errata 2015) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2007; Rev K) Obstruction Marking and Lighting

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009) Manual on Uniform Traffic Control Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G

Traffic Control Plan; G

SD-03 Product Data

Backflow Preventers; G

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.4 BACKFLOW PREVENTERS CERTIFICATE

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

1.5 HURRICANE CONDITION OF READINESS

Unless directed otherwise, comply with:

a. Condition THREE (Sustained winds of 50 knots or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence

securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer.

2.1.2 Project and Safety Signs

The requirements for the signs, their content, and location are as specified in Section 01 58 00 PROJECT IDENTIFICATION. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.2.3 Fencing

Provide fencing along the construction site at all open excavations and tunnels to control access by unauthorized people.

a. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 48 inches high and maximum mesh size of 2 inches, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. Install fencing to be able to restrain a force of at least 250 pounds against it.

b. Enclose the project work area and Contractor lay-down area with a 8 ft high shadow-box type, wooden fence and gates. Remove the fence upon completion and acceptance of the work. Intent is to block (screen) public view of the construction.

c. In addition, prior to the start of work, enclose those areas at the construction site which are not within the construction fence with a temporary safety fence, including gates and warning signs, to protect the public from construction activities. The safety fence shall match the base standard color (or bright orange where it protects excavated areas), shall be made of high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on minimum 10 foot centers. Remove the fence from the work site upon completion of the contract.

2.2.4 Temporary Wiring

Provide temporary wiring in accordance with NFPA 241 and NFPA 70. Include frequent inspection of all equipment and apparatus.

2.2.5 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with 150 pound flanged cast iron or bronze mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. The particular make, model/design, and size of backflow preventers to be installed must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a Certificate of Full Approval from FCCCHR List. After installation conduct Backflow Preventer Tests and provide test reports verifying that the installation meets the FCCCHR Manual Standards.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the government installation.

3.2 TEMPORARY BULLETIN BOARD

Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

3.3 AVAILABILITY AND USE OF UTILITY SERVICES

3.3.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.3.2 Payment for Utility Services

a. The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed will be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. Carefully conserve any utilities furnished without charge.

b. Reasonable amounts of the following utilities will be made available to the Contractor at the rates determined by the Contracting Officer.

c. The point at which the Government will deliver such utilities or services and the quantity available is as indicated. Pay all costs incurred in connecting, converting, and transferring the utilities to the work. Make connections, including providing backflow-preventing devices on connections to domestic water lines; providing meters; and providing transformers; and make disconnections. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

3.3.3 Meters and Temporary Connections

At the Contractors expense and in a manner satisfactory to the Contracting Officer, provide and maintain necessary temporary connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. Notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor will not make the final electrical connection.

3.3.4 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of $50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed to the Contractor prior to the end of the current fiscal year.

3.3.5 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter

reading, disconnect service, and remove the meters. Then remove all the temporary distribution lines, meter bases, and associated paraphernalia. Pay all outstanding utility bills before final acceptance of the work by the Government.

3.3.6 Water

Make connections to existing facilities to provide water for construction purposes. Water used will be furnished by the Government.

3.3.7 Sanitation

a. Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal, district, or commercial sanitary sewer system. Any penalties and / or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times without nuisance. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

b. Provide temporary sewer and sanitation facilities that are self-contained units with both urinals and stool capabilities. Ventilate the units to control odors and fumes and empty and clean them at least once a week or more often if required by the Contracting Officer. The doors shall be self-closing. The exterior of the unit shall match the base standard color. Locate the facility behind the construction fence or out of the public view.

3.3.8 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.3.9 Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 100 feet above ground level. Light construction and installation must comply with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

3.3.10 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

3.4 TRAFFIC PROVISIONS

3.4.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar

days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Make all notifications and obtain any permits required for modification to traffic movements outside Station's jurisdiction. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

3.4.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

3.4.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer.

3.4.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Treat dust abatement on access roads with applications of calcium chloride, water sprinklers, or similar methods or treatment.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor-owned or -leased trailers must be identified by Government assigned numbers. Size and location of the number will comply with base regulations. Apply the number to the trailer within 14 calendar days of notification, or sooner, if directed by the Government.

3.5.1 Safety

Protect the integrity of any installed safety systems or personnel safety devices. If entrance into systems serving safety devices is required, the Contractor must obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of

protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.5.2 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

3.5.3 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored [green][brown], so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store Trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

3.5.4 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor is responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

3.5.5 Appearance of Trailers

a. Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on installation property.

b. Paint in accordance with facility standards and maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal.

3.5.6 Maintenance of Storage Area

a. Keep fencing in a state of good repair and proper alignment. Grassed or unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor's discretion. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and

vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

b. Cut grass (or annual weeds) within the construction and storage sites to a maximum 4 inch height at least once a week during the growing season unless the grass area is not visible to the public. Trim the grass around fences at time of grass cutting. Maintain grass or weeds on stockpiled earth as descried above.

3.5.7 Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

3.5.8 Storage Size and Location

The site available for storage must be confined to the indicated operations area within 1,000 feet of the operations area.

3.5.9 Storage in Existing Buildings

The Contractor will be working in and around existing building[s]; the storage of material will be allowed in a [_____] square foot areawhere indicated.

3.5.10 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.5.10.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

3.6 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor must install a satisfactory means of communication, such as telephone or other suitable devices and made available for use by Government personnel.

3.7 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project

safety fencing at the work site. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, will become the property of the Contractor and be removed from the work site.

3.8 DUMPSTERS

Equip dumpsters with a secure cover and paint the standard installation color. Keep dumpster closed, except when being loaded with trash and debris. Locate dumpsters behind the construction fence or out of the public view. Empty site dumpsters at least once a week, or as needed to keep the site free of debris and trash. If necessary, provide 55 gallon trash containers painted the darker installation color to collect debris in the construction site area. For large demolitions, large dumpsters without lids are acceptable, but must not have debris higher than the sides before emptying.

3.9 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store any salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.10 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore areas used by the Contractor for the storage of equipment or material, or other use to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.31	Standards Applicable to Generators of Hazardous Waste-Labeling
40 CFR 262.34	Standards Applicable to Generators of Hazardous Waste-Accumulation Time
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of

	Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards For Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.3	Standards for Universal Waste Management - Pesticides
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response

	Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink. http://www.epa.gov/ozone/science/ods/classone.html.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. http://www.epa.gov/ozone/science/ods/classtwo.html.

1.2.2 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.4 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.5 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.6 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance

with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

1.2.9 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land

filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.15.3 Material not regulated as solid waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 263.

1.2.15.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, creeks or "waters of the United States". Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.17 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey

Solid Waste Management Permit; G

Regulatory Notifications; G

Environmental Protection Plan; G

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities); G

Dirt and Dust Control Plan; G

SD-06 Test Reports

Laboratory Analysis

Inspection Reports

Solid Waste Management Report; G

SD-07 Certificates

ECATTS Certificate Of Completion; G

Certificate of Competency

Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Stormwater Pollution Prevention Plan Compliance Notebook; G

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities); G

Disposal Documentation for Hazardous and Regulated Waste; G

Solid Waste Management Permit; G

Contractor Hazardous Material Inventory Log; G

Hazardous Waste/Debris Management; G

Regulatory Notifications; G

Contractor Certification

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Training in Environmental Compliance Assessment Training and Tracking System (ECATTS)

1.4.1.1 Personnel Requirements

The Environmental Manager is responsible for environmental compliance on projects. The Environmental Manager and other staff, must complete applicable ECATTS training modules (installation specific or general) prior to starting respective portions of on-site work under this

Contract. If personnel changes occur for any of these positions after starting work, replacement personnel must complete applicable ECATTS training within 14 days of assignment to the project.

1.4.1.2 Certification

Submit an ECATTS certificate of completion for personnel who have completed the required ECATTS training. This training is web-based and can be accessed from any computer with Internet access using the following instructions.

Register for NAVFAC Environmental Compliance Training and Tracking System, by logging on to https://environmentaltraining.ecatts.com/. Obtain the password for registration from the Contracting Officer.

1.4.1.3 Refresher Training

This training has been structured to allow contractor personnel to receive credit under this contract and to carry forward credit to future contracts. Ensure the Environmental Manager review their training plans for new modules or updated training requirements prior to beginning work. Some training modules are tailored for specific state regulatory requirements; therefore, Contractors working in multiple states will be required to retake modules tailored to the state where the contract work is being performed.

1.4.2 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to

start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer within 15 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP). Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements.

Train personnel to meet EPA and state requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Contact additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of

archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area.

1.5.5 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after Contract award and not less than 10 days before the preconstruction meeting. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, wastewater management plan, air pollution control plan, traffic control plan Hazardous, Toxic and Radioactive Waste (HTRW) Plan Non-Hazardous Solid Waste Disposal Plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is

responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

a. Land resources.

b. Tree protection.

c. Replacement of damaged landscape features.

d. Temporary construction.

e. Stream crossings.

f. Fish and wildlife resources.

g. Wetland areas.

1.6.4 Protection of Historical and Archaeological Resources

a. Objectives.

b. Methods.

1.6.5 Stormwater Management and Control

a. Ground cover.

b. Erodible soils.

c. Temporary measures:

1. Structural Practices.

2. Temporary and permanent stabilization.

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

1.6.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste. Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan. As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated.

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated.

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications.

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers).

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted).

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268).

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar.

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures.

i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment.

Notifications in the event of a release to the environment.

1.6.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.9 Clean Air Act Compliance

1.6.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager).

1.6.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

1.6.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government, coordinate with the Installation Environmental

Office to determine the appropriate turn in location.

1.6.9.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7. Notify the Government of all general use permitted equipment the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7.

1.8 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.8.1 Solid Waste Management Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.9 FACILITY HAZARDOUS WASTE GENERATOR STATUS

NAVAL Station Newport is designated as a Large Quantity Generator. Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.1.1 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.1.1.1 Erosion Control

Prevent erosion by mulching, Compost Blankets, Geotextiles, or temporary slope drains. Stabilize slopes by chemical stabilization, sodding, seeding, or such combination of these methods necessary for effective erosion control. Use of hay bales is prohibited.

3.1.1.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fence. Location and details of installation and construction are indicated on the drawings.

3.1.2 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.1.3 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.1.4 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements.

3.2 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.2.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least

6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

Confirm that these permits have been obtained.

3.2.2 Oil or Dual-fuel Boilers and Furnaces

Provide product data and details for new, replacement, or relocated fuel fired boilers, heaters, or furnaces to the Installation Environmental Office (Air Program Manager) through the Contracting Officer. Data to be reported include: equipment purpose (water heater, building heat, process), manufacturer, model number, serial number, fuel type (oil type, gas type) size (MMBTU heat input). Provide in accordance with paragraph PRECONSTRUCTION AIR PERMITS.

3.2.3 Burning

Burning is prohibited on the Government premises.

3.2.4 Class I and II ODS Prohibition

Class I and II ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the appropriate location for turn in of all reclaimed refrigerant.

3.2.5 Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer.

3.2.6 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.2.7 Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.2.7.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain

excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.2.7.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris. Perform work involving removal of hazardous material in accordance with 29 CFR 1910.

3.2.8 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.3 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.3.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.3.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been

generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	_____ cubic yards or tons as appropriate
C&D Debris Recycled	_____ cubic yards or tons as appropriate
Total C&D Debris Generated	_____ cubic yards or tons as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	_____ cubic yards or tons as appropriate

3.4 WASTE MANAGEMENT AND DISPOSAL

3.4.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g. scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 261 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.4.2 Solid Waste Management

3.4.2.1 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with 40 CFR 260, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Haul waste materials to the Government landfill site designated by the Contracting Officer. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage hazardous material used in construction, including but not limited

to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.4.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer.

3.4.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.4.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262.34 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or 1 quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90 day accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	
Contractor	
Haz/Waste or Regulated Waste POC	
Phone Number	
Type of Waste	
Source of Waste	
Emergency POC	
Phone Number	

Contract Number	
Location of the Site	

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g. training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.4.3.3 Hazardous Waste Disposal

3.4.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off Government property.

3.4.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.4.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.4.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.4.3.3.1.4 Labeling

Determine the Department of Transportation's (DOT's) proper shipping names for waste (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262.31 and applicable state or local regulations.

3.4.3.4 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2.

b. Lamps as described in 40 CFR 273.5.

c. Mercury-containing equipment as described in 40 CFR 273.4.

d. Pesticides as described in 40 CFR 273.3.

e. Section 01 57 19.01 20 SUPPLEMENTAL TEMPORARY ENVIRONMENTAL CONTROLS.

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.4.3.5 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.4.3.6 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Contracting Officer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office. Refer to Section 01 57 19.01 20 SUPPLEMENTAL TEMPORARY ENVIRONMENTAL CONTROLS for the Installation Point of Contact information.

3.4.4 Releases/Spills of Oil and Hazardous Substances

3.4.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer and the state or local authority.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and

local regulations. Contain and clean up these spills without cost to the Government.

3.4.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.4.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.4.6 Wastewater

3.4.6.1 Disposal of wastewater must be as specified below.

3.4.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.4.6.1.2 Surface Discharge

For discharge of ground water, obtain a state or federal permit specific for pumping and discharging ground water prior to surface discharging. Surface discharge in accordance with federal, state, and local laws and regulations.

3.4.6.1.3 Land Application

Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing must be land- applied in accordance with federal, state, and local laws and regulations for land application or discharged into the sanitary sewer with prior approval and notification to the Wastewater Treatment Plant's Operator.

3.5 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan, in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and

estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261.

3.5.1 Contractor Hazardous Material Inventory Log

Submit the "Contractor Hazardous Material Inventory Log"(found at: http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf), which provides information required by (EPCRA Sections 312 and 313) along with corresponding SDS, to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Keep copies of the SDSs for hazardous materials onsite. At the end of the project, provide the Contracting Officer with copies of the SDSs, and the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used.

The Contracting Officer may request documentation for any spills or releases, environmental reports, or off-site transfers.

3.6 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.7 CONTROL AND MANAGEMENT OF ASBESTOS-CONTAINING MATERIAL (ACM)

Manage and dispose of asbestos- containing waste in accordance with 40 CFR 61. Refer to Section 02 82 16.00 20 ASBESTOS ABATEMENT. Manifest asbestos-containing waste and provide the manifest to the Contracting Officer. Notifications to the state and Installation Air Program Manager are required before starting any asbestos work.

3.8 CONTROL AND MANAGEMENT OF LEAD-BASED PAINT (LBP)

Manage and dispose of lead-contaminated waste in accordance with 40 CFR 745 and Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD; Section 02 83 13.00 20 LEAD IN CONSTRUCTION. Manifest any lead-contaminated waste and provide the manifest to the Contracting Officer.

3.9 CONTROL AND MANAGEMENT OF LIGHTING BALLAST AND LAMPS CONTAINING PCBS

Manage and dispose of contaminated waste in accordance with 40 CFR 761. Refer to Section 02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBS AND MERCURY.

3.10 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of oil, including fuel, on the project site is not allowed. Fuel must be brought to the project site each day that work is performed.

3.10.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.10.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.11 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.12 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

SECTION 01 58 00

PROJECT IDENTIFICATION
08/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C1	(2003) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Preliminary drawing indicating layout and text content; G

1.3 QUALITY ASSURANCE

1.3.1 Rendering

Provide the project rendering in accordance with the following drawing stages as required in paragraph entitled "Submittals". The following submittal data is required to properly identify the appropriate view and approve the final rendering of the facility. The final painted rendering will be used to produce the image for the signboard and framed photographic copies provided to the Contracting Officer.

1.4 PROJECT SIGN

Prior to initiating any work on site, provide one project identification signs at the location designated. Construct the sign in accordance with project sign detail, which can be downloaded at: http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf. Maintain sign throughout the life of the project. Upon completion of the project, remove the sign from the site. Provide color rendering of the project. Reproduce the rendering on the signboard or enclose a copy of the rendering under a water-proof, transparent cover, and caulk for weather protection.

1.4.1 Project Identification Signboard (Navy)

A project identification signboard shall be provided in accordance with

attached Plates 1, 3, and 4. Provide preliminary drawing indicating layout and text content.The signboard shall be provided at a conspicuous location on the job site where directed by the Contracting Officer.

a. The field of the sign shall consist of a 4 by 8 foot sheet of grade B-B medium density overlaid exterior plywood.

b. Lumber shall be B or better Southern pine, pressure-preservative treated in accordance with AWPA C1 and AWPA C2. Nails shall be aluminum or galvanized steel.

c. The entire signboard and supports shall be given one coat of exterior alkyd primer and two coats of exterior alkyd enamel paint. The lettering and sign work shall be performed by a skilled sign painter using paint known in the trade as bulletin colors. The colors, lettering sizes, and lettering styles shall be as indicated. Where preservative-treated lumber is required, utilize only cured pressure-treated wood which has had the chemicals leached from the surface of the wood prior to painting.

d. Use spray applied automotive quality high gloss acrylic white enamel paint as background for the NAVFAC logo. NAVFAC logo shall be an applied 2 mil film sticker/decal with either transparent or white background or paint the logo by stencil onto the sign. The weather resistant sticker/decal film shall be rated for a minimum of 2-year exterior vertical exposure. The self-adhering sticker shall be mounted to the sign with pressure sensitive, permanent acrylic adhesive. Shop cut sticker/decal to rectangular shape and provide pull-off backing sheet on adhesive side of design sticker for shipping.

e. Sign paint colors (manufacturer's numbers/types listed below for color identification only):

   1. Blue = To match dark blue color in the NAVFAC logo.

   2. White = To match Brilliant White color in the NAVFAC logo.

f. NAVFAC logo must retain proportions and design integrity. NAVFAC logos in electronic format may be obtained from the NAVFAC web portal via the following link: https://portal.navfac.navy.mil/portal/page?_pageid=181,3465071&_dad=portal&_schema Use the following to choose color values for the paint to be used:

   1. Dark Blue = equivalent to CMYK values 100, 72, 0, 8 .

   2. Light Blue = equivalent to CMYK values 69, 34, 0, 0.

   3. Cyan = equivalent to CMYK values 100, 9, 0, 6.

   4. Yellow = equivalent to CMYK values 0.9,94, 0.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
01/07

PART 1 GENERAL

1.1 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.2 MANAGEMENT

Develop and implement a waste management program. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. The Environmental Manager, as specified in Section 01 57 19.00 20 Temporary Environmental Controls, is responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the project. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste, consider the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. Implement any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records

1.4 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 00.00 2001 45 00.00 10 QUALITY CONTROL. At a minimum, discuss environmental and waste management goals and issues at the following additional meetings:

a. Pre-bid meeting.

b. Preconstruction meeting.

c. Regular site meetings.

d. Work safety meetings.

1.5 WASTE MANAGEMENT PLAN

Submit a waste management plan within 15 days after contract award or notice to proceed and not less than 10 days before the preconstruction meeting. The plan demonstrates how to meet the the project waste diversion goal. Also, include the following in the plan:

a. Name of individuals on the Contractor's staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

e. Characterization, including estimated types and quantities, of the waste to be generated.

f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

g. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and phone number for each reuse facility to be used, and provide a copy of the permit or license for each facility.

h. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, location, and phone number, including a copy of

the permit or license for each facility.

i. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.

j. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.

k. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

l. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

1.6 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Quantities may be measured by weight or by volume, but must be consistent throughout. List each type of waste separately noting the disposal or diversion date. Identify the landfill, recycling center, waste processor, or other organization used to process or receive the solid waste. Provide explanations for any waste not recycled or reused. With each application for payment, submit updated documentation for solid waste disposal and diversion, and submit manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. Make the records available to the Contracting Officer during construction.

1.7 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to subcontractors. Recycling and waste bin areas are to be kept neat and clean, and handle recyclable materials to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods:

1.7.1 Source Separated Method.

Separate waste products and materials that are recyclable from trash and sorted as described below into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate to the project waste and to the available recycling and reuse programs in the project area:

a. Land clearing debris.

b. Asphalt.

c. Concrete and masonry.

d. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).

    1. Ferrous.

    2. Non-ferrous.

e. Wood (nails and staples allowed).

f. Debris.

g. Glass (colored glass allowed).

h. Paper.

    1. Bond.

    2. Newsprint.

    3. Cardboard and paper packaging materials.

i. Plastic.

Type	
1	Polyethylene Terephthalate (PET, PETE)
2	High Density Polyethylene (HDPE)
3	Vinyl (Polyvinyl Chloride or PVC)
4	Low Density Polyethylene (LDPE)
5	Polypropylene (PP)

Type	
6	Polystyrene (PS)
7	Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

j. Gypsum.

k. Non-hazardous paint and paint cans.

l. Carpet.

m. Ceiling tiles.

n. Insulation.

1.7.2 Other Methods.

Other proposed methods may be used when approved by the Contracting Officer.

1.8 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1.8.1 Reuse.

Give first consideration to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Coordinate reuse with the Contracting Officer.

1.8.2 Recycle.

Recycle waste materials not suitable for reuse, but having value as being recyclable. Recycle all fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site. Arrange for timely pickups from the site or deliveries to recycling facilities in order to prevent contamination of recyclable materials.

1.8.3 Waste.

Dispose of materials with no practical use or economic benefit to waste-to-energy plants where available. As the last choice, dispose of materials at a landfill or incinerator.

1.8.4 Return

Set aside and protect misdelivered and substandard products and materials and return to supplier for credit.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used. -- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37	(2012) Cleaning Products for Industrial and Institutional Use

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N	(2014) Navy and Marine Corps Design Procedures
UFC 1-300-08	(2009, with Change 2) Criteria for Transfer and Acceptance of DoD Real Property

1.2 DEFINITIONS

1.2.1 As-Built Drawings

As-built drawings are developed and maintained by the Contractor and depict actual conditions, including deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to Contractor submitted Requests for Information; direction from the Contracting Officer; designs which are the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site. As-built drawings are further defined in NFAS 5252.236-9310. These files serve as the basis for the creation of the record drawings.

1.2.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

1.3 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.3.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan
Warranty Tags
Final Cleaning
Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

SD-11 Closeout Submittals

As-Built Drawings; G
Record Drawings; G
Final Approved Shop Drawings
Construction Contract Specifications

Certification of EPA Designated Items; G
Interim DD FORM 1354; G
Checklist for DD FORM 1354; G
NAVFAC Sustainable & Energy Data Record Card; G

1.5 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

a. Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

1.6 WARRANTY MANAGEMENT

1.6.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to the clause Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of project acceptance and continue for the full product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Include within the warranty management plan, but not limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

c. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

d. A list for each warranted equipment, item, feature of construction or system indicating:

(1) Name of item.
(2) Model and serial numbers.
(3) Location where installed.

(4) Name and phone numbers of manufacturers or suppliers.
(5) Names, addresses and telephone numbers of sources of spare parts.
(6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
(7) Cross-reference to warranty certificates as applicable.
(8) Starting point and duration of warranty period.
(9) Summary of maintenance procedures required to continue the warranty in force.
(10) Cross-reference to specific pertinent Operation and Maintenance manuals.
(11) Organization, names and phone numbers of persons to call for warranty service.
(12) Typical response time and repair time expected for various warranted equipment.

e. The plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

f. Procedure and status of tagging of all equipment covered by extended warranties.

g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.6.2 Performance Bond

The Performance Bond must remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.6.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control

completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.6.4 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	
WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.	

PART 2 PRODUCTS

2.1 CERTIFICATION OF EPA DESIGNATED ITEMS

Submit the Certification of EPA Designated Items as required by FAR 52.223-9, "Certification and Estimate of Percentage of Recovered Material Content for EPA Designated Items." Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

a. The product does not meet appropriate performance standards;

b. The product is not available within a reasonable time frame;

c. The product is not available competitively (from two or more sources);

d. The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

Provide and maintain two black line print copies of the PDF contract drawings for As-Built Drawings. Provide and maintain As-Built Drawings in accordance with NFAS 5252.236-9310. Submit As-Built Drawings 30 days prior to Beneficial Occupancy Date(BOD).

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where items(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

a. Use base colors of red, green, and blue. Color code for changes as follows:

   (1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

   (2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

   (3) Additions (Green) - Added items, lettering in notes and leaders.

b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.

c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

f. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

g. For deletions, cross out all features, data and captions that relate to that revision.

h. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.

i. Indicate one of the following when attaching a print or sketch to a markup print:

(1) Add an entire drawing to contract drawings.

(2) Change the contract drawing to show.

(3) Provided for reference only to further detail the initial design.

j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. The location and dimensions of any changes within the building structure.

c. Layout and schematic drawings of electrical circuits and piping.

d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

g. Changes or Revisions which result from the final inspection.

h. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.

i. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

k. Changes in location of equipment and architectural features.

j. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications) and compliance with FC 1-300-09N procedures.

l. Actual location of anchors, construction and control joints, etc., in concrete.

m. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

n. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 RECORD DRAWINGS

Prepare and provide Record Drawings in accordance with FC 1-300-09N. Provide 2 copies of Record Drawings on two separate CDs or DVDs 30 days after BOD.

3.3 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS, and 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.

3.4 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete or update draft DD FORM 1354 provided by NAVFAC and submit an accounting of all installed property with Interim DD

FORM 1354. Include any additional assets, improvements, and alterations from the Draft DD FORM 1354. Contact the Contracting Officer for any project specific information necessary to complete the DD FORM 1354. Refer to UFC 1-300-08 for instruction on completing the DD FORM 1354. For information purposes, a blank fillable PDF DD FORM 1354 may be obtained at the following: http://www.dtic.mil/whs/directives/forms/eforms/dd1354.pdf.

Submit the completed Checklist for DD FORM 1354 of Installed Building Equipment items. Attach this list to the updated DD FORM 1354.

3.5 NAVFAC SUSTAINABLE & ENERGY DATA RECORD CARD

Within 60 days of the completion of Project, complete an electronic copy of the NAVFAC Sustainable & Energy Data Record Card, and submit to the Contracting Officer. Draft Record card for this project should be available from Designer of Record (DOR) or Contracting Officer. Instructions and a blank DD Form (fill-able) in ADOBE (PDF) may be obtained at the Whole Building Design Guide web site by navigating: Home > Participating Agencies > Department of Defense (DoD) > NAVFAC Sustainable Development Program > Contract Documents > NAVFAC Sustainable & Energy Data Record Card; or directly at http://www.wbdg.org/pdfs/navfac_sustainable_energy_data_record_card.pdf.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA
08/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

O&M Database; G

Training Plan; G

Training Outline; G

Training Content; G

SD-11 Closeout Submittals

Validation of Training Completion; G

1.3 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.3.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.3.2 Package Content

Provide data package content in accordance with paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES. Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Use Data Package 3 for commissioned items without a specified data package requirement in the individual technical sections. Provide a Data Package 3 instead of Data Package 1 or 2, as specified in the individual technical section, for items that are commissioned.

1.3.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.3.4 Commissioning Authority Review and Approval

Submit the commissioned systems and equipment submittals to the Commissioning Authority (CxA) to review for completeness and applicability. Obtain validation from the CxA that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CxA communicates deficiencies to the Contracting Officer. Submit the O&M manuals to the Contracting Officer upon a successful review of the corrections, and with the CxA recommendation for approval and acceptance of these O&M manuals. This work is in addition to the normal review procedures for O&M data.

1.4 OPERATION AND MAINTENANCE MANUAL FILE FORMAT

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory.

1.4.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI Masterformat numbering system, and arrange submittals using the specification sections as a structure. Use CSI Masterformat and UFGS numbers along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.4.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

a. Building Number.

b. Project Title.

c. Activity and Location.

d. Construction Contract Number.

e. Prepared For: (Contracting Agency).

f. Prepared By: (Name, title, phone number and email address).

g. Include the disk content on the disk label.

h. Date.

i. Virus scanning program used.

1.5 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

The following are a detailed description of the data package items listed in paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES.

1.5.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.5.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard.

1.5.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.5.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.5.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.5.1.5 Emergency Operations

Provide Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of

utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.5.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.5.1.7 Environmental Conditions

Provide a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.5.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.5.1.9 Additional Requirements for HVAC Control Systems

Provide Data Package 5 and the following for control systems:

a. Narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.

b. Full as-built sequence of operations.

c. Copies of checkout tests and calibrations performed by the Contractor (not Cx tests).

d. Full points list. Provide a listing of rooms with the following information for each room:

    1. Floor.

    2. Room number.

    3. Room name.

    4. Air handler unit ID.

    5. Reference drawing number.

    6. Air terminal unit tag ID.

    7. Heating or cooling valve tag ID.

    8. Minimum cfm.

    9. Maximum cfm.

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.5.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.5.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph OPERATOR SERVICE REQUIREMENTS:

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.5.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.5.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.5.3 Repair

Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.5.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.5.3.2 Wiring Diagrams and Control Diagrams

Provide point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.5.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.5.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.5.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.5.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.5.4 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.5.4.1 Product Submittal Data

Provide a copy of SD-03 Product Data submittals documented with the

required approval.

1.5.4.2 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.5.4.3 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals documented with the required approval.

1.5.4.4 Parts Identification

Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.

1.5.4.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.4.6 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.4.7 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.5.4.8 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

1.5.4.9 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.5.4.10 Field Test Reports

Provide a copy of Field Test Reports (SD-06) submittals documented with the required approval.

1.5.4.11 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.6 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. The information required in each type of data package follows:

1.6.1 Data Package 1

a. Safety precautions and hazards.

b. Cleaning recommendations.

c. Maintenance and repair procedures.

d. Warranty information.

e. Extended warranty information.

f. Contractor information.

g. Spare parts and supply list.

1.6.2 Data Package 2

a. Safety precautions and hazards.

b. Normal operations.

c. Environmental conditions.

d. Lubrication data.

e. Preventive maintenance plan, schedule, and procedures.

f. Cleaning recommendations.

g. Maintenance and repair procedures.

h. Removal and replacement instructions.

i. Spare parts and supply list.

j. Parts identification.

k. Warranty information.

l. Extended warranty information.

m. Contractor information.

1.6.3 Data Package 3

a. Safety precautions and hazards.

b. Operator prestart.

c. Startup, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Emergency operations.

f. Environmental conditions.

g. Operating log.

h. Lubrication data.

i. Preventive maintenance plan, schedule, and procedures.

j. Cleaning recommendations.

k. Troubleshooting guides and diagnostic techniques.

l. Wiring diagrams and control diagrams.

m. Maintenance and repair procedures.

n. Removal and replacement instructions.

o. Spare parts and supply list.

p. Product submittal data.

q. O&M submittal data.

r. Parts identification.

s. Warranty information.

t. Extended warranty information.

u. Testing equipment and special tool information.

v. Testing and performance data.

w. Contractor information.

x. Field test reports.

1.6.4 Data Package 4.

a. Safety precautions and hazards.

b. Operator prestart.

c. Startup, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Emergency operations.

f. Operator service requirements.

g. Environmental conditions.

h. Operating log.

i. Lubrication data.

j. Preventive maintenance plan, schedule, and procedures.

k. Cleaning recommendations.

l. Troubleshooting guides and diagnostic techniques.

m. Wiring diagrams and control diagrams.

n. Repair procedures.

o. Removal and replacement instructions.

p. Spare parts and supply list.

q. Repair work-hours.

r. Product submittal data.

s. O&M submittal data.

t. Parts identification.

u. Warranty information.

v. Extended warranty information.

w. Personnel training requirements.

x. Testing equipment and special tool information.

y. Testing and performance data.

z. Contractor information.

aa. Field test reports.

1.6.5 Data Package 5

a. Safety precautions and hazards.

b. Operator prestart.

c. Start-up, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Environmental conditions.

f. Preventive maintenance plan, schedule, and procedures.

g. Troubleshooting guides and diagnostic techniques.

h. Wiring and control diagrams.

i. Maintenance and repair procedures.

j. Removal and replacement instructions.

k. Spare parts and supply list.

l. Product submittal data.

m. Manufacturer's instructions.

n. O&M submittal data.

o. Parts identification.

p. Testing equipment and special tool information.

q. Warranty information.

r. Extended warranty information.

s. Testing and performance data.

t. Contractor information.

u. Field test reports.

v. Additional requirements for HVAC control systems.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that

they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. eOMSI Manual, as submitted in Section 01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI). Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 60 calendar days prior to the scheduled training. Training plan must be approved by the Quality Control Manager (QC) and Commissioning Authority (CxA) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and QC and CxA. Include within the plan the following elements:

a. Equipment included in training.

b. Intended audience.

c. Location of training.

d. Dates of training.

e. Objectives.

f. Outline of the information to be presented and subjects covered including description.

g. Start and finish times and duration of training on each subject.

h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts).

i. Instructor names and instructor qualifications for each subject.

j. List of texts and other materials to be furnished by the Contractor that are required to support training.

k. Description of proposed software to be used for video recording of training sessions.

3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The QC is responsible for overseeing and approving the content and adequacy of the training. Provide a brief summary of the FACILITY INFORMATION manual, and a more detailed presentation of the PRODUCT AND DRAWING MANUAL, specified in Section 01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI). Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.

b. Relevant health and safety issues.

c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.

d. Design intent.

e. Use of O&M Manual Files.

f. Review of control drawings and schematics.

g. Interactions with other systems.

h. Special maintenance and replacement sources.

i. Tenant interaction issues.

3.1.3 Training Outline

Provide the eOMSI Manual files as specified in Section 01 78 24.00 20, FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI), and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

3.1.4 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

3.1.5 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

3.1.6 Quality Control Coordination

Coordinate this training with the CxA in accordance with Section 01 45 00.00 20 QUALITY CONTROL.

-- End of Section --

SECTION 01 78 24.00 20

FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI)
02/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N	(2014) Navy and Marine Corps Design Procedures

1.2 DEFINITIONS AND ABBREVIATIONS

1.2.1 eOMSI Manual

Manual (PDF file) provided by the Contractor that includes, but is not limited to, product information, a facility description with photos, and a list of primary facility systems.

1.2.2 eOMSI Facility Data Workbook (FDW)

A Microsoft Excel file containing required facility information populated by the Contractor.

1.2.3 Systems

The words "system", "systems", and "equipment", when used in this document refer to as-built systems and equipment.

1.2.4 Computer Assisted Design and Drafting (CADD)

Electronic Computer Assisted Design and Drafting graphic software program that is used to create facility design contract documents and Record Drawings.

1.2.5 KTR

An abbreviation for "Contractor."

1.3 EOMSI MEETINGS

1.3.1 Pre-Construction Meeting

Be prepared to discuss the following during this meeting:

a. eOMSI Manual and eOMSI Facility Data Workbook Development Meetings

b. Processes and methods of gathering eOMSI Manual and eOMSI Facility Data Workbook information during construction.

c. The eOMSI Submittals schedule. Include the eOMSI submittal schedule

on the Baseline Construction Schedule in accordance with Section 01 32 17.00 20 COST-LOADED NETWORK ANALYSIS SCHEDULE (NAS).

d. Electronic eOMSI Facility Data Workbook file for Contractor's use and completion.

1.3.2 eOMSI Manual and Facility Data Workbook Coordination Meeting

Facilitate a meeting after the Pre-Construction Meeting prior to the submission of the eOMSI Progress Submittal. Meeting attendance must include the Contractor's eOMSI Manual and Facility Data Workbook Preparer, Designer of Record (DOR), and Quality Control Manager, the Commissioning Authority (CxA), and the Government's Design Manager (DM), Contracting Officer's Representative, and NAVFAC Public Works (PW) Facilities Management Division (FMD). Include any Mechanical, Electrical, and Fire Protection Sub-Contractors.

The purpose of this meeting is to reach a mutual understanding of the scope of work concerning the contract requirements for eOMSI and coordinate the efforts necessary by both the Government and Contractor to ensure an accurate collection, preparation and timely Government review of eOMSI.

1.3.3 Facility Turnover Meeting

Include eOMSI in NAVFAC Red Zone (NRZ) facility turnover meetings as specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

1.4 SUBMITTAL SCHEDULING

1.4.1 eOMSI, Progress Submittal

Submit the Progress submittal when construction is approximately 50 percent complete, to the Contracting Officer for approval. Provide eOMSI Manual Files (Bookmarked PDF) and eOMSI Facility Data Workbook (Excel). Include the elements and portions of system construction completed up to this point.

The purpose of this submittal is to verify progress is in accordance with contract requirements as discussed during the eOMSI Coordination Meeting. Field verify a portion of the eOMSI information in accordance with paragraph FIELD VERIFICATION.

1.4.2 eOMSI, Prefinal Submittal

Submit the 100 percent submittal of the eOMSI Prefinal Submittal to the Contracting Officer for approval within 60 calendar days of the Beneficial Occupancy Date (BOD). This submittal must provide a complete, working document that can be used to operate and maintain the facility. Any portion of the submittal that is incomplete or inaccurate requires the entire submittal to be returned for correction. Any discrepancies discovered during the Government's review of eOMSI Progress submittal must be corrected prior to the Prefinal submission.

The eOMSI Prefinal Submittal must include eOMSI Manual Files (Bookmarked PDF) and eOMSI Facility Data Workbook (Excel).

1.4.3 eOMSI, Final Submittal

Submit completed eOMSI Manual Files (Bookmarked PDF) and eOMSI Facility Data Workbook (Excel). The Final submittal is due at BOD. Any discrepancies discovered during the Government's review of the Prefinal eOMSI submittal, including the Field Verification, must be corrected prior to the Final eOMSI submission.

1.5 UNITS OF MEASURE

Provide eOMSI utilizing the units of measure used in the Government generated contract documents.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

eOMSI, Progress Submittal; G

eOMSI, Prefinal Submittal; G

eOMSI, Final Submittal; G

PART 2 PRODUCTS

2.1 eOMSI FILES FORMAT

Format eOMSI manuals and files in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Include a complete electronically linked operation and maintenance directory. Provide four electronic copies of the eOMSI Manuals to the Contracting Officer for approval.

Provide eOMSI Facility Data Workbook on compact disks (CD) or data digital versatile disk (DVD) disks in (EXCEL) format. Scan eOMSI Manual Files and eOMSI Facility Data Workbook for viruses, malware, and spyware using a commercially available scanning program that is routinely updated to identify and remove current virus threats.

2.1.1 eOMSI Manual Organization

Organize the eOMSI Manuals into two parts: 1) Product and Drawing Information, and 2) Facility Information. Bookmark the PDF files for easy access to the information.

a. Bookmark Product and Drawing Information documents in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

b. Bookmark Facility Information to at least one level lower than the major system.

2.1.2 eOMSI Manual CD or DVD Disk Label and Disk Holder or Case

Provide disks in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

2.2 eOMSI MANUAL

2.2.1 Product and Drawing Information

Provide an organized record of the facility products, materials, equipment, and minimum information necessary to operate the facility. Provide Product and Drawing Information for the systems in the final constructed facility.

2.2.1.1 O&M Data

As a minimum, provide the approved O&M Data, submitted in the technical specification sections, in accordance with paragraph TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES in Section 01 78 23 OPERATION AND MAINTENANCE DATA.

2.2.1.2 Record Drawings

Provide an electronic, PDF copy of the Record Drawings, prepared in accordance with FC 1-300-09N and 01 78 00 CLOSEOUT SUBMITTALS. Bookmark drawings using the sheet title and sheet number.

Include Record Drawings as part of the Red-Zone specified in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS.

2.2.1.3 Utility Record Drawings

Using Record Source Drawings, show and document details of the actual installation of the utility systems; annotate and highlight the eOMSI information. Provide Utility Record Drawings in PDF format. Provide the following drawings at a large enough scale to differentiate designated isolation units from surrounding valves and switches.

a. Utility Schematic Diagrams - Provide a one line schematic diagram for each utility system such as power, water, wastewater, and gas/fuel. Schematic diagram must show from the point where the utility line is connected to the mainline up to the five-foot connection point to the facility. Indicate location or area designation for route of transmission or distribution lines; locations of duct banks, manholes/ handholes or poles; isolation units such as valves and switches; and utility facilities such as pump stations, lift stations, and substations.

b. Enlarged Connection and Cutoff Plans - Provide enlarged floor plans that provide information between the five foot utility connection point and where utilities connect to facility distribution. Enlarge floor plans/ elevations of the rooms where the utility enters the building and indicate on these plans locations of the main interior and exterior connection and cutoff points for the utilities. Also enlarge floor plans / elevations of the rooms where equipment is located. Include enough information to enable someone unfamiliar with the facility to locate the connection and cutoff points. Indicate designations such as room number, panel number, circuit breaker, or valve number, of each utility and equipment connection and cutoff point, and what that connection and cutoff point controls.

2.2.2 Facility Information

Provide the following in Facility Information:

2.2.2.1 General Facility and System Description

Describe the function of the facility. Detail the overall dimensions of the facility, number of floors, foundation type, expected number of occupants, and facility Category Code. List and generally describe all the facility systems and any special building features (for example, HVAC Controls, Sprinkler Systems, Cranes, Elevators, and Generators). Include photographs marked up and labeled to show key operating components and the overall facility appearance.

2.2.2.2 Floor Plans

Provide uncluttered, legible 11 by 17 inches floor plans. Include room numbers, type or function of spaces, and overall facility dimensions on the floor plans. Do not include items such as construction instructions, references, or frame numbers.

2.2.2.3 Floor Coverings, Wall Surfaces, and Ceiling Surfaces

Provide a table that lists by room number (including hallways and common spaces), the type, and area of finish, manufacturer's product name, identifying number, and color. Include a facility summary of the total area for each type of space and floor, wall, or ceiling finish in the table.

2.2.2.4 Windows

Provide a table that lists by room number (including hallways and common spaces), the type of window, window size, number of each size and type, special features, manufacturer's product name, identifying number, and color. The table must include a facility summary of the total number for each type and size of window.

2.2.2.5 Roofing

Provide the total area of each type of roof surface and system. Provide the name of the roofing product and system; manufacturer's, supplier's, and installer's names, addresses, and phone numbers; manufacturer's product name, identifying number, and color. For each type of roof, provide a recommended inspection, maintenance and repair schedule that details checkpoints, frequencies, and prohibited practices. List roof structural load limits.

2.2.2.6 HVAC Filters

Provide a table that lists the quantity, type, size, and location of each HVAC filter, manufacturer's product name, and identifying number.

2.2.2.7 Plumbing Fixtures

Provide a table that lists by room number, the number and type of plumbing and bathroom plumbing fixtures (for example, sinks, water closets, urinals, showers and drinking fountains).

2.2.2.8 Lighting Fixtures

Provide a table that lists by room number (including hallways and common spaces), the type of lighting fixture, ballast, number of lighting fixtures, type of lamps and number of lamps, and the manufacturer's product name and the identifying number. The table must include a facility summary of the total number of fixtures of each type and number of lamps of each type.

2.2.2.9 Equipment Listing

Provide a table that lists the major equipment shown on the design equipment schedules. Show the item descriptions, locations, model numbers; and the names, addresses, and telephone numbers of the manufacturers, suppliers, contractors, and subcontractors.

2.2.2.10 System Flow Diagrams

Provide a flow diagram indicating system liquid, air or gas flow during normal operations. Integrate the system components into the diagram. A compilation of non-integrated, flow diagrams for the individual system components are not acceptable.

2.2.2.11 Valve List

Provide a list of all valves associated with the system. Show valve type, identification number, function, location and normal operating position.

2.2.2.12 Riser Diagrams

Provide riser diagrams and settings of equipment.

2.3 eOMSI FACILITY DATA WORKBOOK

An initial, pre-edited draft of the Model & Facility Data Matrix tab within the eOMSI Facility Data Workbook is attached to this section. The Government will provide this eOMSI Facility Data Workbook electronically to the Contractor upon award. Add, delete, and update Mastersystems, Systems, and Subsystems that may have changed during construction, or any items that may have been omitted or missed during design, at no additional cost to the Government. Complete the KTR Facility Data File tab based on the selection of Mastersystems, Systems, and Subsystems installed. The following tabs are included in the eOMSI Facility Data File Workbook and serve the purpose stated:

a. Instructions Tab: Instructions for completing Model & Facility Data Matrix Tab and KTR Facility Data File Tab. If a discrepancy exists between what is required in this section and the Workbook, the instructions within the workbook take precedence.

b. Model & Facility Data Matrix Tab: - The Matrix lists Required Facility Asset Fields for each SYSTEM and SUBSYSTEM. The Designer of Record selects SYSTEMS and SUBSYSTEMS that are within the project scope, which the Contractor needs to include and populate in KTR Facility Data File tab. The "Required Facility Asset Field Position Numbers," one through seventeen, are pre-populated, and are not editable.

c. Required Facility Asset Fields Tab: Defines the 17 Required Facility Asset Field Position Numbers used in Model and Facility Data Matrix

and KTR Facility Data File tabs.

d. KTR Sample Facility Data File Tab: Sample KTR eOMSI facility data file. This tab provides an example of the mandatory fields of equipment installed by the Contractor, and populated in the KTR eOMSI Facility Data File Tab, along with their descriptions.

e. KTR Facility Data File Tab: Required eOMSI facility data file deliverable provided to the Government. Provide a separate and unique new row for each facility component or piece of equipment installed.

PART 3 EXECUTION

3.1 FIELD VERIFICATION

Field verify eOMSI Facility Data Workbook information with Contractor and Government personnel. Include the following personnel in this meeting: Contractor's eOMSI Manual and Facility Data Workbook Preparer and Quality Control Manager, Commissioning Authority, and the Government's Contracting Officer's Representative and NAVFAC PW FMD. Request, and provide, an eOMSI Field Verification Meeting no sooner than 14 calendar days after submission of the Progress eOMSI submittal, and another, no sooner than 14 calendar days after submission of the Prefinal eOMSI submittal. During this meeting, the Government and Contractor will verify that the eOMSI Facility Data Workbook is complete and accurate.

Field verify that at least 5 Subsystems under each of the Mastersystems are accurate, for a total of 25 Subsystems. For each of these items, verify that the required facility asset field, as defined in the "Model & Facility Data Matrix" tab, contains the specified data and it is accurate (i.e. item description, manufacturer, model no., serial no.). 100 percent accuracy of eOMSI information is required for successful field verification. If data discrepancies are discovered amongst the 25 Subsystems verified, resubmit an updated eOMSI FDW, and request a make-up field verification meeting. At the make-up field verification meeting 25 new Subsystems and their associated required facility asset fields will be field verified; the 25 new Subsystems must be 100% accurate. Any discrepancies discovered must be corrected prior to next eOMSI Facility Data Workbook Submittal.

(1) D10 - CONVEYING
(2) D20 - PLUMBING
(3) D30 - HVAC
(4) D40 - FIRE PROTECTION
(5) D50 - ELECTRICAL

3.2 eOMSI TRAINING

Provide training on eOMSI Manuals and Facility Data Workbook in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

-- End of Section --

01 91 00.00 40

COMMISSIONING
11/12

PART 1 GENERAL

The requirements of this Section apply to, and are a component part of, each section of the specifications.

This Section includes:

a. Building commissioning of the following systems:

1. HVAC components and equipment

2. HVAC system: interaction of cooling, heating, and comfort delivery systems

3. Building Automation System (BAS): control hardware and software, sequence of operations, and integration of factory controls with BAS

b. Building commissioning activities and documentation in support of the U.S. Green Building Council (USGBC) LEED BD+C™ rating program. Commissioning activities and documentation include the section on "Energy and Atmosphere" prerequisite of "Fundamental Building Systems Commissioning" and the section on "Additional Commissioning."

The Government, Architect/Engineer, or Commissioning Agent are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.

The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

The following Sections are an integral part of this project Commissioning:

a. Section 01 30 00 ADMINISTRATIVE REQUIREMENTS

b. Section 01 45 00.00 40 QUALITY CONTROL

c. Section 01 45 35 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS

d. Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS

e. Section 01 75 00.00 40 STARTING AND ADJUSTING

f. Section 01 78 23 OPERATION AND MAINTENANCE DATA

g. Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS

h. Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D6245	(2012) Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
ASTM D6345	(2010) Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BD+C	(2009; R 2010) Leadership in Energy and Environmental Design(tm) Building Design and Construction (LEED-NC)
LEED GBDC Ref Guide	(2009; R 2010) LEED Reference Guide for Green Building Design, Construction and Major Renovations of Commercial and Institutional Buildings including Core & Shell and K-12 Projects

1.2 DEFINITIONS

a. Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Project Requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the Project Requirements may be included.

b. Commissioning - Commissioning is a comprehensive and systematic process to verify that the building systems perform as designed to meet the requirements. Commissioning during the construction, acceptance, and warranty phases intends to achieve the following specific objectives:

   1. Verify and document that equipment is installed and started per manufacturer's recommendations, industry accepted minimum standards, and the Contract Documents.

   2. Verify and document that equipment and systems receive complete operational checkout by the installing contractors.

   3. Verify and document equipment and system performance.

   4. Verify the completeness of Operations and Maintenance materials.

   5. Ensure that the operating personnel are adequately trained on the operation and maintenance of the building equipment.

c. Commissioning Agent - develops the functional test procedures in a sequential written form, coordinates, oversees and documents the

actual testing, which is usually performed by the installing contractor or vendor. Functional Performance Tests are performed after pre-functional checklists and startup are complete.

d. Commissioning Plan - an overall plan that provides the structure, schedule and coordination planning for the commissioning process.

e. Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents, does not perform properly, or is not complying with the Project Requirements.

f. Project Requirements - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the Government. It is initially the outcome of the programming and conceptual design phases.

g. Functional Performance Test - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word.

h. Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

i. Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

j. Pre-functional Checklist - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the Commissioning Agent to the contractor. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word "pre-functional" refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

k. Seasonal Performance Tests - Functional Performance Test that are deferred until the system(s) will experience conditions closer to their design conditions.

l. Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in

the Contract Documents and accepted submittals.

1.3 ADMINISTRATIVE REQUIREMENTS

Perform commissioning services for the system. Expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. The commissioning requires cooperation of the Contractor, subcontractors, vendors, Architect/Engineer, Commissioning Agent, Green Consultant, and Contracting Officer.

1.3.1 Co-ordination

Provide a Commissioning Agent for overall co-ordination and management of the commissioning program. The commissioning team comprises the following groups:

a. Contractors Project Manger and Test Engineer

b. Sub-contractor for the system being commissioned

c. Commissioning Agents Project Manager and Project Engineers

d. Contracting Officers Representative

e. Architect/Engineer and Specialty Consultant

Coordinate with IAQ baseline evaluation in conformance with ASTM D6245, and ASTM D6345.

1.3.2 Progress Meetings

Plan and co-ordinate meetings as required to monitor construction and commissioning progress the work. Notify the Contracting Officer of construction job-site meetings to address co-ordination, deficiency resolution and planning issues.

1.3.3 Functional Testing Co-ordination

Do **not** "temporarily" start equipment for commissioning. Do not conduct functional performance testing until a pre-functional, start-up and TAB is completed for a given system. Do not functionally test the controls system and equipment it controls until all points have been calibrated and the pre-functional checklists are completed.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Commissioning Plan; G

Commissioning Schedule; G

SD-05 Design Data

Basis of Design; G

SD-06 Test Reports

Functional Performance Testing Results; G

Deficiency Report and Resolution Record; G

SD-07 Certificates

Commissioning Agents Qualifications; G

SD-10 Operation and Maintenance Data

Operations and Maintenance Manuals; G

Training Plan; G

SD-11 Closeout Submittals

Final Commissioning Report; G

Warranty; G

1.5 QUALITY CONTROL

Commissioning Agents Qualifications: Engage commissioning service personnel, that specialize in the types of inspections and tests to be performed.

1.6 DESIGN REVIEW AND DOCUMENTATION

Document basis of design and Project Requirements as they relate to environmentally responsive characteristics, including:

a. Functionality

b. Energy performance

c. Water efficiency

d. Maintainability

e. System cost

f. Indoor environmental quality

g. Local environmental impacts

Review design documents to verify that each commissioned system meets the Project Requirements, including conformance with ASTM D6245, ASTM D6345, and LEED GBDC Ref Guide for new construction.

Review construction documents to verify that commissioning is adequately specified, that each commissioned system can be commissioned and is likely to meet the Project Requirements.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

Ensure instrumentation used for testing meets the following standards:

a. Sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.

b. Calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.

c. Maintained in good repair and operating condition throughout the duration of use on this project.

Provide all standard testing equipment required for performing startup and initial checkout and required functional performance testing for the system. Datalogging equipment or software required to test equipment will be provided by the Commissioning Agent, and not become the property of the Government.

2.1.1 Commissioning Plan

Develop a commissioning plan to identify how commissioning activities will be integrated into general construction and trade activities. The commissioning plan identifies how commissioning responsibilities are distributed. The intent of this plan is to evoke questions, expose issues, and resolve them with input from the entire commissioning team early in construction.

The Plan identifies who is responsible for producing the various procedures, reports, forms, and notifications. It will include the commissioning schedule and describe the test/acceptance procedure.

2.2 START-UP/PRE-FUNCTIONAL CHECKLISTS

Coordinate start-up plans and documentation formats, including pre-functional checklists to be completed during the startup process. Manufacturer's start-up checklists and other technical documentation guidelines can be used as the basis for pre-functional checklists.

PART 3 EXECUTION

3.1 COMMISSIONING PROCESS

The Commissioning Agent coordinates all activities. The following activities outline the commissioning tasks and the general order in which they occur.

a. Design Review and documentation consisting of:

    1. Documentation of Basis of Design and Project Requirements

    2. Design Development Review

    3. Pre-Final and Final Construction Document Review

b. Commissioning Kickoff Meeting

c. Commissioning Plan

d. Submittals Review

e. Start-Up/Pre-Functional Checklists

f. Functional Performance Testing

g. Deficiency Report and Resolution Record

h. Operations and Maintenance Training

i. Record Documents Review

j. Final Commissioning Report and LEED™ Documentation

k. Deferred testing due to unforeseen deferred tests, or end of Warranty review.

3.2 FUNCTIONAL PERFORMANCE TESTING

Fully describe system test procedures identifying configuration and steps required for each test. Provide appropriate documents so that another party can repeat the tests with virtually identical results.

Submit documentation to the Contracting Officer verifying conformance with the following standards:

3.2.1 Functional Performance Test Procedures

Develop functional performance test procedures for equipment and systems. Identify specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Coordinate test procedures with the contractor for feasibility, safety, equipment and warranty protection.

Include the following information on the functional performance test forms:

a. System and equipment or component name(s)

b. Equipment location and ID number

c. Date

d. Project name

e. Participating parties

e. Instructions for setting up the test, including special cautions, alarm limits, etc.

f. Specific step-by-step procedures to execute the test

g. Acceptance criteria of proper performance with a Yes / No check box

h. Comment section

3.2.2 Test Methods

Methods for functional performance testing and verification include direct manipulation of system inputs (i.e. heating or cooling sensors), manipulation of system inputs with the building automation system (i.e. software override of sensor inputs), trend logs of system inputs and outputs using the building automation system, or short-term monitoring of system inputs and outputs using stand alone data loggers. The Commissioning Agent determines which method, or combination of methods, is most appropriate.

3.2.3 Setup

Perform each test procedure under conditions that simulate normal operating conditions as closely as possible. Where equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met, have functional performance test procedures demonstrate the actual performance of safety shutoffs in a real or closely-simulated conditions of failure.

3.2.4 Sampling

The Commissioning Agent develops a sampling strategy when multiple identical pieces of non-life-safety or non-critical equipment may be functionally tested. If, after three test attempts at testing the specified sample percentage, failures are still present, then test all remaining units at the contractors' expense.

3.2.5 Functional Performance Testing Results

Coordinate, observe and record the results of the functional performance testing. Coordinate retesting as necessary until satisfactory performance is verified. Verify the intended operation of individual components and system interactions under various conditions and modes of operation.

3.3 DEFICIENCY REPORT AND RESOLUTION RECORD

Document items of non-compliance in materials, installation or operation.

3.3.1 Non-Conformance

Immediately address observed non-conformance and deficiencies in terms of notification to responsible parties, and provide recommended actions to correct deficiencies.

Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Agent. In such cases document the deficiency and resolution on the procedure form.

3.3.1.1 Identified Deficiencies Correction Procedure

If there is no dispute on the deficiency and the responsibility to correct it:

a. The Commissioning Agent documents the deficiency and the adjustments or alterations required to correct it. The Contractor corrects the deficiency and notifies the Commissioning Agent that the equipment is ready to be retested.

b. The Commissioning Agent reschedules the test and the test is repeated.

If there is a dispute about a deficiency or who is responsible:

a. The deficiency is documented on the non-compliance form and a copy given to the Contractor.

b. Resolutions are made at the lowest management level possible. Additional parties are brought into the discussions as needed. Contractor has responsibility for resolving construction deficiencies. If a design revision is deemed necessary and approved by the Contracting Officer, the Architect/Engineer has responsibility for providing a design revision.

c. The Commissioning Agent documents the resolution process.

d. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the Commissioning Agent that the equipment is ready to be retested. The Commissioning Agent reschedules the test and the test is repeated until satisfactory performance is achieved.

The Contractor is responsible for retesting costs.

3.4 OPERATIONS AND MAINTENANCE TRAINING

Provide complete operations and maintenance manuals, a training plan and an operations and maintenance database.

Coordinate and review with the Contracting Officers' representative the training program for O&M personnel.

Develop the database from the O&M manual containing the information required to start a preventative maintenance program.

Provide additional materials as necessary to stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation.

3.5 FINAL COMMISSIONING REPORT AND LEED™ DOCUMENTATION

Compile and submit a Final Commissioning Report. Summarize all of the tasks, findings, conclusions, and recommendations of the commissioning process.

Compile and submit LEED™ Documentation. Format as required by USGBC for submittal under the referenced green building rating system.

3.6 DEFERRED TESTING

3.6.1 Unforeseen Deferred Tests

If a test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon recommendation of the Commissioning Agent and the approval of the Contracting Officer. Conduct these tests in the same manner as the seasonal tests as soon as possible.

3.6.2 End-of-Warranty Review

Conduct end of warranty review prior to the end of the warranty period. Review the current building operation with the facility maintenance staff. Include in the review all outstanding issues from original or seasonal testing. Interview facility staff to identify concerns with building operation. Provide suggestions for improvements and assist Contracting Officer in developing reports or documentation to remedy problems.

Update O&M manuals and Record Documents as necessary due to the testing.

3.7 EQUIPMENT AND SYSTEM SCHEDULE

Commission the following equipment in this project.

System	Equipment	Check
HVAC System	Variable frequency drives	100%
	Air Handlers	100%
	Packaged AC Terminal units	50%
BAS System		

-- End of Section --

SECTION 02 41 00

DEMOLITION
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K	(2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6	(2006) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25	(June 2000) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures
MIL-STD-129	(2007; Rev P; Change 4 2007) Military Marking for Shipment and Storage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Demolition Plan

Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started.. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes recycling of materials. Remove rubbish and debris from the station daily; do not allow accumulations inside or outside the buildings . The work includes demolition and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements or pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of

existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off and disconnected and sealed by the Contractor where indicated.

1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted. Where burning is permitted, adhere to federal, state, and local regulations.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions; G

SD-07 Certificates

Demolition Plan; G

Notification; G

SD-11 Closeout Submittals

Receipts

1.6 QUALITY ASSURANCE

Submit timely notification of demolitionand renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the Regional Office of the United States Environmental Protection Agency (USEPA) State's environmental protection agency, local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building, on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area weekly. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.7 PROTECTION

1.7.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind. Notify the Contracting Officer prior to beginning such work.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.9 EXISTING CONDITIONS

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record

existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

2.2 TOPSOIL

2.2.1 On-Site Topsoil

All on-site topsoil outside of the tree protection zones shall be stripped and stockpiled. This topsoil will be redistributed during final grading operations to provide a suitable growing medium for turf and plantings. No topsoil shall be disturbed or stripped from within the tree protection zones or at locations which would result in damage to existing protected trees. Preservation and protection of this topsoil is critical.

PART 3 EXECUTION

3.1 Structures

a. Remove existing structures indicated to be removed to bottom of foundations as indicated and as required to construct the new facilities. Remove sidewalks, curbs, gutters and street light bases as indicated.

b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.

c. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

d. Buildings, not exceeding 80 feet in height may be demolished by the mechanical method of demolition.

3.2 Utilities and Related Equipment

3.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.2.2 Disconnecting Existing Utilities

Remove existing utilities , as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location on the station in accordance with instructions of the Contracting Officer.

3.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated full-depth as required for utility installation. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the project site and disposed of in accordance with GTMO construction debris and disposal requirements.

3.4 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain, and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as indicated. Provide square, straight edges and corners where existing masonry adjoins new work and other locations.

3.5 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.6 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size.

3.7 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, priority shall be given to a

local recycling organization.

3.8 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

a. Concrete and Masonry: Completely fill holes and depressions, left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

3.9 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.10 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.11 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings.

3.11.1 Ducts

Classify removed duct work as scrap metal.

3.11.2 Fixtures, Motors and Machines

Remove fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations.

3.12 Electrical Equipment and Fixtures

Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.12.1 Fixtures

Remove electrical fixtures.

3.12.2 Electrical Devices

Remove switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items.

3.12.3 Wiring Ducts or Troughs

Remove wiring ducts or troughs.

3.12.4 Conduit and Miscellaneous Items

Remove conduit and miscellaneous items.

3.13 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.14 DISPOSITION OF MATERIAL

3.14.1 Title to Materials

All materials and equipment removed shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.14.2 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified.

3.14.2.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

d. Date of shipment

e. Naval stock number (for information, call (804) 279-4525).

3.14.2.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.14.3 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.14.4 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable combustible material off the site.

3.15 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.16 DISPOSAL OF REMOVED MATERIALS

3.16.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified off the site.

3.16.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

3.16.3 Removal from Government Property

Transport waste materials removed from demolished structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

-- End of Section --

SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

IATA DGR	(2013) Dangerous Goods Regulations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP 415-1-266	(2000) Resident Engineer Management Guide (REMG) for Hazardous, Toxic, and Radioactive Waste (HTRW) Projects

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

DOT 4500.9R	Defense Transportation Regulation, Part 2, Cargo Movement, Chapter 204, Hazardous Material

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

RI DER 1: The State of Rhode Island and Providence Plantations (RI) Department of Environmental Management Rhode Island Universal Waste Rule, Fact Sheet Dated January 2011.

RI DER 2: RI Fact Sheet Regarding Changes to Rules and Regulations for Hazardous Waste Management Effective February 10, 2014.

1.2 DEFINITIONS

1.2.1 Hazardous Material

A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S.C. Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Sections .101 and .102 and materials which meet the defining criteria for hazard classes and divisions in 49 CFR 173. EPA designated hazardous wastes are also hazardous materials.

1.2.2 Hazardous Waste

A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261 or which has been designated as hazardous by a RCRA authorized state program.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability

Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Onsite Hazardous Waste Management; G
Notices of Non-Compliance and Notices of Violation
Packaging Notifications

SD-06 Test Reports

Recordkeeping; G
Spill Response; G
Exception Report

SD-07 Certificates

Certification
Security Plan; G
Transportation and Disposal Coordinator; G
Training; G
EPA Offsite Policy
Certificates of Disposal; G
Shipping Documents and Packagings Certification; G
Waste Minimization; G

1.4 QUALITY ASSURANCE

1.4.1 Transportation and Disposal Coordinator

Designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC shall serve as the single point of contact for all environmental regulatory matters and shall have overall responsibility for total environmental compliance at the site including, but not limited to, accurate identification and classification of hazardous waste and hazardous materials; determination of proper shipping names; identification of marking, labeling, packaging and placarding requirements; completion of waste profiles, hazardous waste manifests, asbestos waste shipment records, PCB manifests, bill of ladings, exception and discrepancy reports; and all other environmental documentation. The TDC shall have, at a minimum, one year of specialized experience in the management and transportation of hazardous waste and have been Department of Transportation certified under 49 CFR 172, Subpart H.

1.4.2 Training

The Contractor's hazardous materials employees shall be trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with all applicable Federal, State and Local requirements. The Contractor's employees transporting hazardous materials or preparing hazardous materials for transportation, including samples, shall be trained, tested, and certified in accordance with 49 CFR 172, Subpart H, including security awareness and any applicable security plans. Where shipment of hazardous materials by air may be occurring, such as for sample shipments, the Contractor's hazardous material employees shall also be trained on IATA DGR. Contractor employees making determinations that shipments do not constitute DOT regulated hazardous materials shall also

be trained, tested, and certified in accordance with 49 CFR 172, Subpart H.

1.4.3 Certification

The Contractor and/or subContractors transporting hazardous materials shall possess a current certificate of registration issued by the Research and Special Programs Administration (RSPA), U.S. Department of Transportation, when required by 49 CFR 107, Subpart G. Submit copies of the certificates or written statements certifying exemption from these requirements.

1.4.4 Laws and Regulations Requirements

Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations which are applicable. These requirements are amended frequently and compliance with amendments is required as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, notify the Contracting Officer immediately.

PART 2 PRODUCTS

2.1 MATERIALS

Provide all the materials required for the packaging, labeling, marking, placarding and transportation of hazardous wastes and hazardous materials in conformance with Department of Transportation and State of Rhode Island Waste Stream Requirements. Details in this specification shall not be construed as establishing the limits of the Contractor's responsibility.

2.1.1 Packagings

Provide bulk and non-bulk containers for packaging hazardous materials/wastes consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 8. Bulk and non-bulk packaging shall meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 49 CFR 172, Section .101. Each packaging shall conform to the general packaging requirements of Subpart B of 49 CFR 173, to the requirements of 49 CFR 178 at the specified packing group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section .101, and shall be compatible with the material to be packaged as required by 40 CFR 262. Also provide other packaging related materials such as materials used to cushion or fill voids in overpacked containers, etc. Sorbent materials shall not be capable of reacting dangerously with, being decomposed by, or being ignited by the hazardous materials being packaged. Additionally, sorbents used to treat free liquids to be disposed of in landfills shall be non-biodegradable as specified in 40 CFR 264, Section .314. In addition, packaging notifications will be provided to the Government in accordance with 49 CFR 172, Section .178.2(c) regarding type and dimensions of closures, including gaskets, needed to satisfy performance test requirements.

2.1.2 Markings

Provide markings for each hazardous material/waste package, freight container, and transport vehicle consistent with the requirements of 49 CFR 172, Subpart D and 40 CFR 262, Section .32 (for hazardous waste) 40 CFR 761, Section .45 (for PCBs) 40 CFR 61, Section .149(d) (for

asbestos) EP 415-1-266 (for FUSRAP radionuclides). Markings shall be capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

2.1.3 Labeling

Provide primary and subsidiary labels for hazardous materials/wastes consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 6. Labels shall meet design specifications required by 49 CFR 172, Subpart E including size, shape, color, printing, and symbol requirements. Labels shall be durable and weather resistant and capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

2.1.4 Placards

For each offsite shipment of hazardous material/waste, provide primary and subsidiary placards consistent with the requirements of 49 CFR 172, Subpart F. Placards shall be provided for each side and each end of bulk packaging, freight containers, transport vehicles, and rail cars requiring such placarding. Placards may be plastic, metal, or other material capable of withstanding, without deterioration, a 30 day exposure to open weather conditions and shall meet design requirements specified in 49 CFR 172, Subpart F.

2.1.5 Spill Response Materials

Provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled.

2.2 EQUIPMENT AND TOOLS

Provide miscellaneous equipment and tools necessary to handle hazardous materials and hazardous wastes in a safe and environmentally sound manner.

PART 3 EXECUTION

3.1 ONSITE HAZARDOUS WASTE MANAGEMENT

These paragraphs apply to Government owned waste only. Contractors are prohibited by 10 U.S.C. 2692 from storing Contractor owned waste onsite for any length of time. The Contractor is responsible for ensuring compliance with all Federal, state, and local hazardous waste laws and regulations and shall verify those requirements when preparing reports, waste shipment records, hazardous waste manifests, or other documents. Identify hazardous wastes using criteria set forth in 40 CFR 261 or all applicable state and local laws, regulations, and ordinances. When accumulating hazardous waste onsite, comply with generator requirements in 40 CFR 262 and any applicable state or local law or regulations. Onsite accumulation times shall be restricted to applicable time frames referenced in 40 CFR 262, Section .34 and any applicable state or local law or regulation. Accumulation start dates shall commence when waste is first generated (i.e. containerized or otherwise collected for discard). Only use containers in good condition and compatible with the waste to be

stored. Ensure containers are closed except when adding or removing waste, and immediately mark all hazardous waste containers with the words "hazardous waste" and other information required by 40 CFR 262, Section .32 and any applicable state or local law or regulation as soon as the waste is containerized. An additional marking shall be placed on containers of "unknowns" designating the date sampled, and the suspected hazard. Inspect containers for signs of deterioration and for responding to any spills or leaks. Inspect all hazardous waste areas weekly and provide written documentation of the inspection. Include date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken on the inspection logs.

3.1.1 Hazardous Waste Classification

Identify, in consultation with the Contracting Officer and the NAVSTA NPT Environmental Office, all waste codes applicable to each hazardous waste stream based on requirements in 40 CFR 261 or any applicable state or local law or regulation. Also identify all applicable treatment standards in 40 CFR 268 and state land disposal restrictions and make a determination as to whether or not the waste meets or exceeds the standards. Waste profiles, analyses, classification and treatment standards information shall be submitted to Contracting Officer and the NAVSTA NPT Environmental Office for review and approval.

3.1.2 Management Plan

Prepare a plan detailing the manner in which hazardous wastes will be managed and describing the types and volumes of hazardous wastes anticipated to be managed as well as the management practices to be utilized. The plan shall identify the method to be used to ensure accurate piece counts and/or weights of shipments; shall identify waste minimization methods; shall propose facilities to be utilized for treatment, storage, and/or disposal; shall identify areas onsite where hazardous wastes are to be handled; and shall identify whether transfer facilities are to be utilized; and if so, how the wastes will be tracked to ultimate disposal. Submit the plan prior to start of work. Written documentation of weekly hazardous waste inspections shall be submitted on a monthly basis.

3.2 OFFSITE HAZARDOUS WASTE MANAGEMENT

Use RCRA Subtitle C permitted facilities which meet the requirements of 40 CFR 264 or facilities operating under interim status which meet the requirements of 40 CFR 265. Offsite treatment, storage, and/or disposal facilities with significant RCRA violations or compliance problems (such as facilities known to be releasing hazardous constituents into ground water, surface water, soil, or air) shall not be used. Submit Notices of Non-Compliance and Notices of Violation by a Federal, state, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. Immediately provide copies of such notices to the Contracting Officer and the NAVSTA NPT Environmental Office. Also furnish all relevant documents regarding the incident and any information requested by the Contracting Officer, and coordinate its response to the notice with the Contracting Officer or the designated representative prior to submission to the notifying authority. Also furnish a copy to the Contracting Officer of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

3.2.1 Treatment, Storage, and/or Disposal Facility and Transporter

Provide the Contracting Officer and the NAVSTA NPT Environmental Office with EPA ID numbers, names, locations, and telephone numbers of TSD facilities and transporters. This information shall be contained in the Hazardous Waste Management Plan and shall be approved by the Contracting Officer and the NAVSTA NPT Environmental Office prior to waste disposal.

3.2.2 Status of the Facility

Facilities receiving hazardous waste shall be permitted in accordance with 40 CFR 270 or operating under interim status in accordance with 40 CFR 265 requirements, or permitted by a state authorized by the Environmental Protection Agency to administer the RCRA permit program. Additionally, prior to using a TSD Facility, contact the EPA Regional Offsite Coordinator specified in 40 CFR 300, Section .440, to determine the facility's status, and document all information necessary to satisfy the requirements of the EPA Offsite policy and submit this information to the Contracting Officer and the NAVSTA NPT Environmental Office.

3.2.3 Shipping Documents and Packagings Certification

Prior to shipment of any hazardous material offsite and a minimum of 14 days prior to anticipated pickup, provide for review written certification to the Contracting Officer and the NAVSTA NPT Environmental Office that hazardous materials have been properly packaged, labeled, and marked in accordance with Department of Transportation and EPA requirements. Furnish designated disposal facility packaging assurances by the not later than 35 days after acceptance of the shipment. The Contractor's TDC shall also provide written certification regarding waste minimization efforts documenting that efforts have been taken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.2.4 Transportation

Prior to conducting hazardous materials activities, the Contractor responsible for pre-transportation activities shall either certify to the Government that a Security Plan is in place which meets the requirements of 49 CFR 172, Subpart I or in the event that the types or amounts of hazardous materials are excluded from the security planning requirements, a written statement to that effect detailing the basis for the exception. Use manifests for transporting hazardous wastes as required by 40 CFR 263 or any applicable state or local law or regulation. Transportation shall comply with all requirements in the Department of Transportation referenced regulations in the 49 CFR series. Prepare hazardous waste manifests for each shipment of hazardous waste shipped offsite. Manifests shall be completed using instructions in 40 CFR 262, Subpart B and any applicable state or local law or regulation. Submit manifests and waste profiles to Contracting Officer and the NAVSTA NPT Environmental Office for review and approval. Prepare land disposal restriction notifications as required by 40 CFR 268 or any applicable state or local law or regulation for each shipment of hazardous waste. Submit notifications with the manifest to the Contracting Officer and the NAVSTA NPT Environmental Office for review and approval. In accordance with DOT 4500.9R, inspect motor vehicles used to transport hazardous materials in accordance the 49 CFR and DOT safety regulations and complete DDForm 626, Motor Vehicle Inspection.

3.2.5 Treatment and Disposal of Hazardous Wastes

The hazardous waste shall be transported to an approved hazardous waste treatment, storage, or disposal facility within 30 days of the accumulation start date on each group of containers. Ship hazardous wastes only to facilities which are properly permitted to accept the hazardous waste or operating under interim status. Ensure wastes are treated to meet land disposal treatment standards in 40 CFR 268 prior to land disposal. Propose TSD facilities via submission of the Hazardous Waste Management Plan, subject to the approval of the Contracting Officer and the NAVSTA NPT Environmental Office. Submit Certificates of Disposal documenting the ultimate disposal, destruction or placement of hazardous wastes, CERCLA remediation waste, polychlorinated biphenyls (PCBs), and/or asbestos within 30 days of initial shipment. Receipt of these certificates will be required for final payment.

3.3 RADIOACTIVE MATERIALS MANAGEMENT

In consultation with the Contracting Officer and the NAVSTA NPT Environmental Office, evaluate, prior to shipment of any material offsite, whether the material is regulated as a hazardous waste in addition to being regulated as a radioactive material; this shall be done for the purpose of determining proper shipping descriptions, marking requirements, etc., as described below.

3.3.1 Identification of Proper Shipping Names

Use 49 CFR 172, Section .101 to identify proper shipping names for each hazardous material (including hazardous wastes) to be shipped offsite. Submit proper shipping names to the Contracting Officer in the form of draft shipping documents for review and approval.

3.3.2 Packaging, Labeling, and Marking

Package, label, and mark hazardous materials/wastes using the specified materials and in accordance with the referenced authorizations. Mark each container of hazardous waste of 110 gallons or less with the following:

"HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal.
If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
Generator's name _____
Manifest Document Number _____".

3.3.3 Shipping Documents

Ensure that each shipment of hazardous material sent offsite is accompanied by properly completed shipping documents. This includes shipments of samples that may potentially meet the definition of a Department of Transportation regulated hazardous material.

3.3.3.1 PCB Waste Shipment Documents

Prepare hazardous waste manifests for each shipment of PCB waste shipped offsite. Complete manifests using instructions in 40 CFR 761, Sections .207 and .208 and all other applicable requirements. Submit documents to Contracting Officer for review and approval.

3.3.3.2 Asbestos Waste Shipment Documents

Prepare waste shipment records, as required by 40 CFR 61, for shipments of asbestos. Submit waste shipment records to the Contracting Officer and the NAVSTA NPT Environmental Office for review and approval. Waste shipment records shall be signed by the NAVSTA NPT Environmental Office.

3.3.3.3 Other Hazardous Material Shipment Documents

Prepare a bill of lading for each shipment of hazardous material which is not accompanied by a hazardous waste manifest or asbestos waste shipment record which fulfills the shipping paper requirements. The bill of lading shall satisfy the requirements of 49 CFR 172, Subpart C, and 40 CFR 279 if shipping used oil and any applicable state or local law or regulation, and shall be submitted to the Contracting Officer and the NAVSTA NPT Environmental Office for review and approval. For laboratory samples and treatability study samples, prepare bills of lading and other documentation as necessary to satisfy conditions of the sample exclusions in 40 CFR 261, Section .4(d) and (e) and any applicable state or local law or regulation. Bill of ladings requiring shipper's certifications will be signed by the Government Contractor.

3.4 OBTAINING EPA ID NUMBERS

Complete EPA Form 8700-12, Notification of Hazardous Waste Activity, and submit to the Contracting Officer and the NAVSTA NPT Environmental Office for review and approval. Allow a minimum of 30 days for processing the application and assigning the EPA ID number. Shipment shall be made not earlier than one week after receipt of the EPA ID number.

3.5 SPECIAL REQUIREMENTS FOR ASBESTOS WASTES

If work involves asbestos containing wastes, manage these wastes in accordance with specification Section 02 82 16.00 20.

3.6 WASTE MINIMIZATION

Minimize the generation of hazardous waste to the maximum extent practicable and take all necessary precautions to avoid mixing clean and contaminated wastes. Identify and evaluate recycling and reclamation options as alternatives to land disposal. Requirements of 40 CFR 266 shall apply to: hazardous wastes recycled in a manner constituting disposal; hazardous waste burned for energy recovery; lead-acid battery recycling; and hazardous wastes with economically recoverable precious metals. Submit written certification that waste minimization efforts have been undertaken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.7 RECORDKEEPING

Maintain adequate records to support information provided to the Contracting Officer regarding exception reports, annual reports, and biennial reports; maintain asbestos waste shipment records for a minimum of 3 years from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract; and maintain bill of ladings for a minimum of 375 days from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract. Submit information necessary to

file state annual or EPA biennial reports for all hazardous waste transported, treated, stored, or disposed of under this contract. Do not forward these data directly to the regulatory agency but to the Contracting Officer and the NAVSTA NPT Environmental Office at the specified time. The submittal shall contain all the information necessary for filing of the formal reports in the form and format required by the governing Federal or state regulatory agency. A cover letter shall accompany the data to include the contract number, Contractor name, and project location. In the events that a manifest copy documenting receipt of hazardous waste at the treatment storage and disposal facility is not received within 35 days of shipment initiation, or that a manifest copy documenting receipt of PCB waste at the designated facility is not received within 35 days of shipment initiation, prepare and submit an exception report to the Contracting Officer within 37 days of shipment initiation.

3.8 SPILL RESPONSE

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), notify the Contracting Officer and the NAVSTA NPT Environmental Office immediately. Any direction from the Contracting Officer and the NAVSTA NPT Environmental Office concerning a spill or release shall not be considered a change under the contract. If the spill exceeds a reporting threshold, follow the pre-established procedures for immediate reporting to the Contracting Officer and the NAVSTA NPT Environmental Office. Comply with all applicable requirements of Federal, state, or local laws or regulations regarding any spill incident.

3.9 EMERGENCY CONTACTS

The Contractor is responsible for complying with the emergency contact provisions in 49 CFR 172, Section .604. Whenever the Contractor ships hazardous materials, provide a 24 hr emergency response contact and phone number of a person knowledgeable about the hazardous materials being shipped and who has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. The phone shall be monitored on a 24 hour basis at all times when the hazardous materials are in transportation, including during storage incidental to transportation. Ensure that information regarding this emergency contact and phone number are placed on all hazardous material shipping documents. Designate an emergency coordinator and post the following information at areas in which hazardous wastes are managed:

a. The name of the emergency coordinator.

b. Phone number through which the emergency coordinator can be contacted on a 24 hour basis.

c. The telephone number of the local fire department.

d. The location of fire extinguishers and spill control materials.

Attachment A SAMPLE OFF-SITE POLICY CERTIFICATION MEMO	
Project/Contract #:	
Waste Stream:	
Primary TSD Facility, EPA ID # and Location:	
Alter. TSD Facility, EPA ID # and Location:	
EPA Region	Contact
I	(617) 918-1752
II	(212) 637-4130
III	(214) 814-5267
IV	(404) 562-8591
V	(312) 353-8207
VI	(214) 665-2282
VII	(913) 551-7154
VIII	(303) 312-6419
IX	(415) 972-3304
X	(206) 553-2859
EPA representative contacted:	
EPA representative phone number:	
Date contacted:	
Comment:	
The above EPA representative was contacted on _____. As of that date the above sites were considered acceptable in accordance with the Off-Site Policy in 40 CFR 300.440.	
Date:	Signature:
Phone number:	

-- End of Section --

SECTION 02 82 16.00 20

ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA Z88.6	(2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE Z9.2	(2012) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM C732	(2006; R 2012) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1368	(2014) Visual Inspection of Asbestos Abatement Projects
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024	(1985) Guidance for Controlling Asbestos-Containing Materials in Buildings

(Purple Book)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.103	Respiratory Protection
29 CFR 1926.1101	Asbestos
29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.51	Sanitation
29 CFR 1926.59	Hazard Communication
40 CFR 61-SUBPART A	General Provisions
40 CFR 61-SUBPART M	National Emission Standard for Asbestos
40 CFR 763	Asbestos

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

ND OPNAVINST 5100.23	(2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

RI23-24.5-ASB	Rhode Island Regulations for Asbestos Control

1.2 DEFINITIONS

1.2.1 ACM

Asbestos Containing Materials.

1.2.2 Amended Water

Water containing a wetting agent or surfactant with a maximum surface tension of 0.00042 psi.

1.2.3 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.4 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is

determined to be at least one percent.

1.2.5 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.6 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.7 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.8 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.9 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.2.10 Competent Person

A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent. The competent person shall have a current State of Rhode Island asbestos contractors or supervisors license.

1.2.11 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.12 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

a. Removal Encapsulant (can be used as a wetting agent).

b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material).

c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage).

d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.13 Friable Asbestos Material

One percent asbestos containing material that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.2.14 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101 Appendix G.

1.2.15 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.16 Navy Consultant (NC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The NC is normally a private consultant, but can be an employee of the Government.

1.2.17 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.18 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.19 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.20 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.21 Qualified Person (QP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The QP must be qualified to perform visual inspections as indicated in ASTM E1368. The QP shall be appropriately licensed in the State of Rhode Island.

1.2.22 TEM

Refers to Transmission Electron Microscopy.

1.2.23 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.24 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 0.00042 psi.

1.3 REQUIREMENTS

1.3.1 Description of Work

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures shall be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. The asbestos work includes the demolition and removal of material that has been left or missed by previous abatement operations or roof vent flashing that may or may not be impacted by these renovations. In addition, a black water sealant exists behind the building facade. This waterproofing material or membrane may be impacted if the new exterior panels must be mounted through the facade. If the new exterior panels are to be mounted through the facade, the workers installing the mechanical fasteners shall don appropriate PPE during this operation and shall be subject to personal air monitoring in accordance with OSHA until a negative exposure assessment can be established. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during exterior panel installation, demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide negative pressure enclosure and/or complete work using non friable techniques and HEPA shrouded equipment techniques as outlined in this specification. The Navy will evacuate the building during the asbestos

abatement work. All asbestos removal work shall be supervised by a competent person as specified herein.

1.3.1.1 Wallboard/Joint Compound

Both composite samples of the wallboard and discrete samples of the components (wallboard and joint compound) have been tested and results are attached. In this case both the wallboard and joint compound were found NONE DETECTED for asbestos content.

1.3.2 Medical Requirements

Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

1.3.2.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other pertinent State or local directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.3.2.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 50 years after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.3.3 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Certificates shall be organized by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. Train all personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or State training criteria whichever is more stringent. The Contractor shall document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing

administered by the PQP as required by 29 CFR 1926.1101. Fully cover engineering and other hazard control techniques and procedures. All asbestos workers shall have a current State of Rhode Island asbestos worker's license.

1.3.4 Permits, Licenses, and Notifications

Obtain necessary permits and licenses in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities prior to the start of work. Notify the Regional Office of the United States Environmental Protection Agency (USEPA) State's environmental protection agency the Rhode Island Department of Environmental Protection, the NAVSTA NPT Environmental Office and the Contracting Officer in writing 20 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M and RI23-24.5-ASB. Notify the Contracting Officer, NAVSTA NPT Environmental Office and other appropriate Government agencies in writing 20 working days prior to the start of asbestos work as indicated in applicable laws, ordinances, criteria, rules, and regulations. Submit copies of all Notifications to the Contracting Officer and NAVSTA NPT Environmental Office.

1.3.5 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, and ND OPNAVINST 5100.23. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government shall apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

a. RI23-24.5-ASB; Rhode Island Rules and Regulations for Asbestos Control and the Rhode Island Asbestos Act (Title 23-24.5).

1.3.6 Respiratory Protection Program

Establish and implement a respirator program as required by AIHA Z88.6, 29 CFR 1926.1101, and 29 CFR 1926.103. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.3.6.1 Respirator Program Records

Submit records of the respirator program as required by AIHA Z88.6, 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7 Asbestos Hazard Control Supervisor

The Contractor shall be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.3.8 Hazard Communication

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Material Safety Data Sheets (MSDS) for all materials brought to the site.

1.3.9 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the encapsulation removal and demolition of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, shall be prepared, signed, and sealed by the PQP. The plan shall include single line drawings depicting each intended work area, the location of the personnel decontamination chamber, and waste container. The plan shall also detail the employee negative exposure assessment procedures requested previously in this section and shall provide for interior and exterior testing during the installation of mechanical mounts for the exterior panels. Provide a Table of Contents for each abatement submittal, which shall follow the sequence of requirements in the contract. Such plan shall include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan shall also include (both fire and medical emergency) response plans. The Asbestos Hazard Abatement Plan must be approved in writing by the NAVSTA NPT Environmental Office prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor, and PQP shall meet with the Contracting Officer and NAVSTA NPT Environmental Office prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer and NAVSTA NPT Environmental Office, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.10 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and/or permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm shall be independent of the asbestos

contractor and shall have no employee or employer relationship which could constitute a conflict of interest.

1.3.11 Landfill Approval

Submit written evidence that the landfill is for asbestos disposal by the U.S. Environmental Protection Agency, Region 3, Air Enforcement Section (38W12), and local regulatory agencies. Within 3 working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the waste shipment records within 1 day of the shipment leaving the project site.

1.3.12 Medical Certification

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1926.103 as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Local exhaust equipment; G

Vacuums; G

Respirators; G

Pressure differential automatic recording instrument; G

Amended water; G

Glovebags; G

Material Safety Data Sheets (MSDS) for all materials proposed for transport to the project site; G

Encapsulants; G

SD-06 Test Reports

Air sampling results; G

Pressure differential recordings for local exhaust system; G

Asbestos disposal quantity report; G

Encapsulation test patches; G

Clearance sampling; G

SD-07 Certificates

Asbestos hazard abatement plan; G

Testing laboratory; G

Private qualified person documentation; G

Contractor's license; G

Competent person documentation; G

Worker's license; G

Landfill approval; G

Employee training; G

Medical certification requirements; G

Waste shipment records and if applicable exemption report; G

Respiratory Protection Program; G

Delivery tickets; G

Vacuums; G

Water filtration equipment; G

Ventilation systems; G

Other equipment used to contain airborne asbestos fibers; G

Chemical encapsulants sealers; G

Notifications; G

Show compliance with ASSE Z9.2 by providing manufacturers' certifications.

SD-11 Closeout Submittals

Notifications; G

Rental equipment; G

Respirator program records; G

Permits and licenses; G

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the Private Qualified

Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The PQP shall be appropriately licensed in the State of Rhode Island. The PQP and the asbestos contractor shall not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP shall be a first tier subcontractor of the General Contractor.

1.5.2 Competent Person Documentation

Submit training certification and a current State of Rhode Island Asbestos Contractor's and Supervisor's License.

1.5.3 Worker's License

Submit documentation that requires all workers have a current State of Rhode Island Asbestos Workers License.

1.5.4 Contractor's License

Contractor shall have current Rhode Island asbestos contractor's license. Submit a copy of the asbestos contractor's license issued by the State of Rhode Island.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the NAVSTA NPT Environmental Office, the PQP and NC for review within 16 hours of the "time off" of the sample pump. Notify the Contracting Officer and the NAVSTA NPT Environmental Office immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within 3 working days, signed by the testing laboratory employee performing air sampling, the employee that analyzed the sample, and the PQP and NC. Notify the Contractor the NAVSTA NPT Environmental Office and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24 hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP and NC for review and to the Contracting Officer and the NAVSTA NPT Environmental Office within 24 hours from the end of each work day.

1.5.7 Not Applicable.

1.5.8 Not Applicable.

1.6 EQUIPMENT

1.6.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements.

2.1.1 Removal Encapsulants

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.2 Bridging Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M

Requirement	Test Standard
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.3 Penetrating Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E119
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.4 Lock-down Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test

Requirement	Test Standard
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E119
Bond Strength: 100 pounds of force/foot	ASTM E736
(Tests compatibility with cementitious and fibrous fireproofing)	

PART 3 EXECUTION

3.1 EQUIPMENT

At all times, provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

3.1.1.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, encapsulation removal and or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103.

3.1.2 Exterior Whole Body Protection

3.1.2.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but shall not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.2.2 Work Clothing

Provide cloth work clothes for wear under the outer protective clothing

and foot coverings and either dispose of or properly decontaminate them as recommended by the PQP after each use.

3.1.2.3 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Decontamination units shall be physically attached to the asbestos control area. Build both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.2.4 Not Applicable.

3.1.2.5 Eye Protection

Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.3 Warning Signs and Labels

Provide bilingual warning signs printed in English and the language of the Contractors work force at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

3.1.3.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
Danger	one inch Sans Serif Gothic or Block
Asbestos	one inch Sans Serif Gothic or Block

Legend	Notation
Cancer and Lung Disease Hazard	1/4 inch Sans Serif Gothic or Block
Authorized Personnel Only	1/4 inch Sans Serif Gothic or Block
Respirators and Protective Clothing are Required in this Area	1/4 inch Sans Serif Gothic or Block

Spacing between lines shall be at least equal to the height of the upper of any two lines.

3.1.3.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM

3.1.4 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ASSE Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment shall be operated 24 hours per day, until the asbestos control area is removed and shall be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. In no case shall the building ventilation system be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment shall conform to ASSE Z9.2 and UL 586. The local exhaust system shall terminate out of doors and remote from any public access or ventilation system intakes.

3.1.5 Tools

Vacuums shall be leak proof to the filter and equipped with HEPA filters. Filters on vacuums shall conform to ASSE Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse.

3.1.6 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.1.7 Glovebags

Submit written manufacturers proof that glovebags will not break down under expected temperatures and conditions.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures appropriate encapsulation procedures as listed in the asbestos hazard abatement plan and negative pressure enclosure and/or non-friable abatement techniques. Personnel shall wear and utilize protective clothing and equipment as specified herein. Eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics shall not be permitted in the asbestos work or control areas. Personnel of other trades not engaged in the encapsulation removal and demolition of asbestos containing material shall not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, and provide temporary heating, ventilation, and air conditioning prior to the commencement of asbestos work. Disconnect electrical service when wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water encapsulant. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the PQP work may proceed at the discretion of the Contracting Officer.

3.2.2 Furnishings

Furniture and equipment will be removed from the area of work by the Government before asbestos work begins.

3.2.3 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.4 Asbestos Control Area Requirements

3.2.4.1 Negative Pressure Enclosure

Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development shall include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

3.2.4.2 Glovebag

The construction of a negative pressure enclosure may be infeasible for the removal of residual located between floors in the slab or in other hard to reach locations. Use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP shall conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.5 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Asbestos containing material shall be containerized while wet. At no time shall asbestos material be allowed to accumulate or become dry. Lower and otherwise handle asbestos containing material as

indicated in 40 CFR 61-SUBPART M.

3.2.5.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant shall be tinted a contrasting color. It shall be spray-applied by airless method. Thoroughness of sealing operation shall be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants shall comply with the performance requirements specified herein.

3.2.5.2 Exposed Pipe Insulation Edges

Contain edges of asbestos insulation to remain that are exposed by a removal operation. Wet and cut the rough ends true and square with sharp tools and then encapsulate the edges with a 1/4 inch thick layer of non-asbestos containing insulating cement troweled to a smooth hard finish. When cement is dry, lag the end with a layer of non-asbestos lagging cloth, overlapping the existing ends by at least 4 inches. When insulating cement and cloth is an impractical method of sealing a raw edge of asbestos, take appropriate steps to seal the raw edges as approved by the Contracting Officer.

3.2.6 Not Applicable.

3.2.7 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the PQP. Sampling performed for environmental and quality control reasons shall be performed by the NC. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate.

3.2.7.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.7.2 Sampling During Asbestos Work

The PQP shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic

centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.2.7.3 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP shall perform a visual inspection in accordance with ASTM E1368 to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed. Perform at least 5 samples. Use transmission electron microscopy (TEM) or PLM (as appropriate for the quantity of abated material) to analyze clearance samples and report the results in accordance with current NIOSH criteria. The asbestos fiber counts from these samples shall be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and TEM analysis at the Contractor's expense.

3.2.8 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP shall conduct a visual inspection of all areas affected by the removal in accordance with ASTM E1368. Inspect for any visible fibers, and to ensure that encapsulants were applied evenly and appropriately. A post removal (lock-down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.9 Site Inspection

While performing asbestos engineering control work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation shall be at the Contractor's expense.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being

distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry will be permitted. The Government shall have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

All waste materials, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified in applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling preprinted on the bag. The name of the waste generator and the location at which the waste was generated shall be clearly indicated on the outside of each container. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with 2 layers plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or State-approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61-SUBPART M, State, regional, and local standards. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags shall remain in the drum and the entire contaminated drum shall be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums shall wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer and NAVSTA NPT Environmental Office, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. All waste manifests for all waste generated as part of this section shall be signed by the NAVSTA NPT Environmental Office or their designated representative.

-- End of Section --

SECTION 02 83 13.00 20

LEAD IN CONSTRUCTION
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA Z88.6	(2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780	(1995; Errata Aug 1996;Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.103	Respiratory Protection
29 CFR 1926.21	Safety Training and Education
29 CFR 1926.33	Access to Employee Exposure and Medical Records
29 CFR 1926.55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.59	Hazard Communication
29 CFR 1926.62	Lead
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and

	Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period.

1.2.2 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.3 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. A Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals is the best choice.

1.2.4 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.5 Decontamination Shower Facility

That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

1.2.6 High Efficiency Particulate Arrestor (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against

0.3 micron or larger size particles.

1.2.7 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.8 Lead Control Area

A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.9 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a work day, the PEL shall be determined by the following formula:

a. PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day.

1.2.10 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01 percent). An X-Ray Fluorescence (XRF) instrument is not considered a valid test method.

1.2.11 Personal Sampling

Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

1.2.12 Physical Boundary

Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

1.3 DESCRIPTION

1.3.1 Description of Work

Construction activities impacting PWL or material containing lead which are covered by this specification include the demolition and/or removal of material containing lead in GOOD condition. It is not the intent of this section to provide for lead based paint abatement, but to protect workers in accordance with the OSHA Lead in Construction Standard. Many of the painted surfaces tested are considered to be lead-containing paint by definition (greater than 0.0 mg/cm^2 and less than 1.0 mg/cm^2). It is

recommended that any contractor performing work that will disturb these surfaces comply with OSHA standard 29 CFR 1926.62, “Lead in Construction Standard,” as well as all applicable federal, state, and local requirements pertaining to the disturbance of lead-containing paint.

1.3.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead activities.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment); G

Lead Compliance Plan including CP approval (signature, date, and certification number); G

Competent Person qualifications; G

Training Certification of workers and supervisors; G

lead waste management plan; G

written evidence that TSD is approved for lead disposal; G

Certification of Medical Examinations; G

SD-06 Test Reports

sampling results; G

Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing laboratory qualifications; G

Occupant Notification; G

Third party consultant qualifications; G

Clearance Certification; G

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility; G

Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at sanitary or construction and demolition landfills; G

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Competent Person (CP)

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead, experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained in accordance with federal, State and local laws. The competent person shall be a licensed lead-based paint abatement Supervisor/Project Designer in the State of Rhode Island.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air and wipe analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis shall be OSHA approved.

1.5.1.4 Third Party Consultant Qualifications

Submit the name, address and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead in dust. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA authorized State (or local) certification and accreditation program.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

a. Verify training meets all federal, State, and local requirements.

b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.

c. Continuously inspect PWL or MCL work for conformance with the approved plan.

d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.

e. Ensure work is performed in strict accordance with specifications at all times.

f. Control work to prevent hazardous exposure to human beings and to the environment at all times.

g. Supervise final cleaning of the lead control area, take clearance wipe samples if necessary; review clearance sample results and make recommendations for further cleaning.

h. Certify the conditions of the work as called for elsewhere in this specification.

1.5.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of PWL or MCL. The plan shall include a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

The plan shall be developed by a certified planner/project designer in the State of Rhode Island.

1.5.2.3 Occupational and Environmental Assessment Data Report

If initial monitoring is necessary, submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

In order to reduce the full implementation of 29 CFR 1926.62, the Contractor shall provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62 and supporting the Lead Compliance Plan.

a. The initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. The data shall represent the worker's regular daily exposure to lead for stated work.

b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.

c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62.

1.5.2.4 Medical Examinations

Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs lead, who performs MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62, and State and local regulations where appropriate.

1.5.2.6 Respiratory Protection Program

a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.

b. Establish and implement a respiratory protection program as required by AIHA Z88.6, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.8 Lead Waste Management

The Lead Waste Management Plan shall comply with applicable requirements of federal, State, and local hazardous waste regulations and address:

a. Identification and classification of wastes associated with the work.

b. Estimated quantities of wastes to be generated and disposed of.

c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and operator and a 24-hour point of contact. Furnish two copies of USEPA State and local hazardous waste permits manifests and USEPA Identification numbers as applicable. If the State of Rhode Island allows the waste stream to go as C&D waste, the Contractor must provide supporting data in written form to the Contracting Officer and the NAVSTA NPT Environmental Office.

d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.

h. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.

i. Unit cost for hazardous waste disposal according to this plan.

1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.5.3 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer and the NAVSTA NPT Environmental Office to discuss in detail the Lead Waste Management Plan and the Lead Compliance Plan, including procedures and precautions for the work.

1.6 EQUIPMENT

1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust, fume and mist. Respirators shall comply with the requirements of 29 CFR 1926.62.

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of any lead work.

3.1.1.2 Lead Control Area

a. Physical Boundary - Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area.

b. Warning Signs - Provide warning signs at approaches to lead control

areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.1.1.3 Furnishings

The Government will remove furniture and equipment from the building before lead work begins.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area. Provide temporary HVAC system for areas in which HVAC has been shut down outside the lead control area.

3.1.1.5 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

3.1.1.6 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

3.1.1.7 Mechanical Ventilation System

a. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.

b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.

c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.8 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead Control Area Requirements

If the removal of materials will not create dust and debris, establish a lead control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

If the activities will generate excessive dust and debris, full

containment - Contain removal operations by the use of critical barriers and HEPA filtered exhaust a negative pressure enclosure system with decontamination facilities and with HEPA filtered exhaust if required by the CP. For containment areas larger than 1,000 square feet install a minimum of two 18 inch square viewing ports. Locate ports to provide a view of the required work from the exterior of the enclosed contaminated area. Glaze ports with laminated safety glass.

3.3 APPLICATION

3.3.1 Lead Work

Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when the work is performed in accordance with 29 CFR 1926.62, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, State, and local requirements.

3.3.2 Paint with Lead or Material Containing Lead Removal

Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

3.3.2.1 Paint with Lead or Material Containing Lead - Indoor Removal

Perform manual mechanical removal in the lead control areas using enclosures, barriers or containments and powered locally exhausted tools as may be applicable. Collect residue for disposal in accordance with federal, State, and local requirements.

3.3.2.2 Paint with Lead or Material Containing Lead - Outdoor Removal

Not Applicable.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn in the control area:

a. Vacuum all clothing before entering the contaminated change room.

b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.

c. Shower.

d. Change to clean clothes prior to leaving the clean clothes storage area.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air and Wipe Sampling

Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air and wipe sampling shall be directed or performed by the CP.

a. The CP shall be on the job site directing the air and wipe sampling and inspecting the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.

b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

c. Submit results of air samples, signed by the CP, within 72 hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead-based paint removal operations are performed, in areas immediately adjacent to the lead control area. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above 30 micrograms per cubic meter of air. If 30 micrograms per cubic meter of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Removal work shall resume only after the CP and the Contracting Officer give approval.

e. Before any work begins, a third party consultant shall who is a first tier sub contractor of the General Contractor collect and analyze baseline wipe samples in accordance with methods defined by federal, State, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to lead disturbance or removal.

f. Surface Wipe Samples - Collect surface wipe samples on floors at a location no greater than 10 feet outside the lead control area at a frequency of once per day while lead removal work is conducted in occupied buildings. Surface wipe results shall meet criteria in paragraph "Clearance Certification.

3.4.1.2 Sampling After Removal

After the visual inspection, collect wipe samples according to the HUD protocol contained in HUD 6780 to determine the lead content of settled dust in micrograms per square meter foot of surface area.

3.4.1.3 Testing of Material Containing Lead Residue

Test residue in accordance with 40 CFR 261 for hazardous waste.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP shall then certify in writing that the area has been cleaned of lead contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 micrograms per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

The third party consultant shall certify surface wipe sample results collected inside and outside the work area are less than 40 micrograms per square foot on floors, less than 250 micrograms per square foot on interior window sills and less than 400 micrograms per square foot on window troughs.

The third party consultant shall certify surface wipe sample results collected inside and outside the work area are less than 200 micrograms per square foot on floors or horizontal surfaces.

3.5.2 Disposal

a. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws and provisions and all federal, State or local regulations. Ensure all waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.

b. Contractor is responsible for segregation of waste. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62 and 40 CFR 261.

c. Dispose of lead-contaminated material classified as hazardous waste at a State approved hazardous waste treatment, storage, or disposal facility off Government property.

d. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums. Properly label each drum to identify the

type of waste (49 CFR 172) and the date the drum was filled. For hazardous waste, the collection drum requires marking/labeling in accordance with 40 CFR 262 during the accumulation/collection timeframe. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.

e. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

3.5.2.1 Disposal Documentation

Submit written evidence to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA, State or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Contractor shall provide a certificate that the waste was accepted by the disposal facility. Provide turn-in documents or weight tickets for non-hazardous waste disposal.

3.5.2.2 Payment for Hazardous Waste

Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials or non-hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

SECTION 02 84 16

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

The State of Rhode Island and Providence Plantations (RI) Department of Environmental Management Rhode Island Universal Waste Rule, Fact Sheet Dated January 2011.

RI Fact Sheet Regarding Changes to Rules and Regulations for Hazardous Waste Management Effective February 10, 2014.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 273	Standards For Universal Waste Management
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 178	Specifications for Packagings

1.2 REQUIREMENTS

Removal and disposal of PCB containing lighting ballasts and associated mercury-containing lamps. Contractor may encounter leaking PCB ballasts.

1.3 DEFINITIONS

1.3.1 Certified Industrial Hygienist (CIH)

A industrial hygienist hired by the contractor shall be certified by the American Board of Industrial Hygiene.

1.3.2 Leak

Leak or leaking means any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

1.3.3 Lamps

Lamp, also referred to as "universal waste lamp", is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

1.3.4 Polychlorinated Biphenyls (PCBs)

PCBs as used in this specification shall mean the same as PCBs, PCB containing lighting ballast, and PCB container, as defined in 40 CFR 761, Section 3, Definitions.

1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

1.3.6 Universal Waste

Universal Waste means any of the following hazardous wastes that are managed under the universal waste requirements 40 CFR 273:

a. Batteries as described in Sec. 273.2 of this chapter;

b. Pesticides as described in Sec. 273.3 of this chapter;

c. Thermostats as described in Sec. 273.4 of this chapter; and

d. Lamps as described in Sec. 273.5 of this chapter.

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

Perform PCB related work in accordance with 40 CFR 761 and DEM OWM-HW01-07

Rules and Regulations for Hazardous Waste Management. Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and DEM OWM-HW01-07 Rules and Regulations for Hazardous Waste Management.

1.4.2 Training

Certified industrial hygienist (CIH) shall instruct and certify the training of all persons involved in the removal of PCB containing lighting ballasts and mercury-containing lamps. The instruction shall include: The dangers of PCB and mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations. The CIH shall review and approve the PCB and Mercury-Containing Lamp Removal Work Plans.

1.4.3 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of 29 CFR 1910.1000, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 265, 40 CFR 268, 40 CFR 270, 40 CFR 273 and DEM OWM-HW01-07 Rules and Regulations for Hazardous Waste Management and all associated updates, bulletins and fact sheets and of the Contractor removal work plan and disposal plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Qualifications of CIH; G

Training Certification; G

PCB and Lamp Removal Work Plan; G

PCB and Lamp Disposal Plan; G

SD-11 Closeout Submittals

Transporter certification of notification to EPA of their PCB waste activities and EPA ID numbers; G

Certification of Decontamination; G

Certificate of Disposal and/or recycling. Submit to the Government before application for payment within 30 days of the date that the disposal of the PCB and mercury-containing lamp waste identified on the manifest was completed; G

DD Form 1348-1; G

Testing results; G

1.6 ENVIRONMENTAL REQUIREMENTS

Use special clothing:

a. Disposable gloves (polyethylene).

b. Eye protection.

c. PPE as required by CIH.

1.7 SCHEDULING

Notify the Contracting Officer and NAVSTA NPT Environmental Office 20 days prior to the start of PCB and mercury-containing lamp removal work.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of CIH

Submit the name, address, and telephone number of the Industrial Hygienist selected to perform the duties in paragraph entitled "Certified Industrial Hygienist." Submit training certification that the Industrial Hygienist is certified, including certification number and date of certification or re certification.

1.8.2 PCB and Lamp Removal Work Plan

Submit a job-specific plan within 20 calendar days after award of contract of the work procedures to be used in the removal, packaging, and storage of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan: Requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking and restroom procedures. The plan shall be approved and signed by the Certified Industrial Hygienist. Obtain approval of the plan by the Contracting Officer prior to the start of PCB and/or lamp removal work.

1.8.3 PCB and Lamp Disposal Plan

Submit a PCB and lamp Disposal Plan with 45 calendar days after award of contract. The PCB and Lamp Disposal Plan shall comply with applicable requirements of federal, state, and local PCB and Universal waste regulations and address:

a. Estimated quantities of wastes to be generated, disposed of, and recycled.

b. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location. Furnish two copies of EPA and state PCB and mercury-containing lamp waste permit applications and EPA identification numbers, as required.

c. Names and qualifications (experience and training) of personnel who will be working on-site with PCB and mercury-containing lamp wastes.

d. Spill prevention, containment, and cleanup contingency measures to be implemented.

e. Work plan and schedule for PCB and mercury-containing lamp waste

removal, containment, storage, transportation, disposal and or recycling. Wastes shall be cleaned up and containerize daily.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lamps in accordance with local, state, or federal regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps.

3.1.1 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262 40 CFR 263, and the applicable requirements of this section, including but not limited to:

a. Obtaining suitable PCB and mercury-containing lamp storage sites.

b. Notifying Contracting Officer prior to commencing the operation.

c. Reporting leaks and spills to the Contracting Officer.

d. Cleaning up spills.

e. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.

f. Maintaining inspection, inventory and spill records.

3.2 PCB SPILL CLEANUP REQUIREMENTS

3.2.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills.

3.2.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

3.2.3 PCB Spill Cleanup

40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible, but no later than 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

3.2.4 Records and Certification

Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide test results of cleanup and certification of decontamination.

3.3 REMOVAL

3.3.1 Ballasts

As ballast are removed from the lighting fixture, inspect label on ballast. Ballasts without a "No PCB" label shall be assumed to contain PCBs and containerized and disposed of as required under paragraphs STORAGE FOR DISPOSAL and DISPOSAL. If there are less than 1600 "No PCB" labeled lighting ballasts dispose of them as normal demolition debris. If there are more than 1600 "No PCB" labeled ballasts, establish whether the "No PCB" labeled ballasts contain diethylhexyl phthalate (DEHP) either by test or by checking with the ballast manufacturer indicated on the label. Submit testing results and/or written confirmation from the manufacturer to the Contracting Officer. If the ballasts do not contain DEHP, dispose of them as normal construction debris. If they do contain DEHP, dispose of them as hazardous material in accordance with Federal, State, and local regulations. As a basis of bid assume ballasts with "No PCB" labels do not contain DEHP and may disposed of as normal construction debris. If 1600 or more DEHP ballasts are disposed of in a 24 hour period, notify the National Response Team at 800-424-8802.

3.3.2 Lighting Lamps

Remove lighting tubes/lamps from the lighting fixture and carefully place (unbroken) into appropriate containers (original transport boxes or equivalent). In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as universal waste as specified herein.

3.4 STORAGE FOR DISPOSAL

3.4.1 Storage Containers for PCBs

49 CFR 178. Store PCB in containers approved by DOT for PCB.

3.4.2 Storage Containers for lamps

Store mercury containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

3.4.3 Labeling of Waste Containers

Label with the following:

a. Date the item was placed in storage and the name of the cognizant activity/building.

b. "Caution Contains PCB," conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.

c. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.5 DISPOSAL

Dispose of off Government property in accordance with EPA, DOT, and local regulations at a permitted site.

3.5.1 Identification Number

Federal regulations 40 CFR 761, and 40 CFR 263 require that generators, transporters, commercial storers, and disposers of PCB waste posses U.S. EPA identification numbers. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Uniform Hazardous Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work. For mercury containing lamp removal, Federal regulations 40 CFR 273 require that large quantity handlers of Universal waste (LQHUW) must provide notification of universal waste management to the appropriate EPA Region (or state director in authorized states), obtain an EPA identification number, and retain for three years records of off-site shipments of universal waste. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Universal Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work.

3.5.2 Transporter Certification

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the PCB waste, sign and date the manifest acknowledging acceptance of the PCB waste from the Government. Return a signed copy to the Government before leaving the job site. Ensure that the manifest accompanies the PCB waste at all times. Submit transporter certification of notification to EPA of their PCB waste activities (EPA Form 7710-53).

3.5.2.1 Certificate of Disposal and/or Recycling

40 CFR 761. Certificate for the PCBs and PCB items disposed shall include:

a. The identity of the disposal and or recycling facility, by name, address, and EPA identification number.

b. The identity of the PCB waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.

c. A statement certifying the fact of disposal and or recycling of the identified PCB waste, including the date(s) of disposal, and identifying the disposal process used.

d. A certification as defined in 40 CFR 761.

3.5.3 Disposal by the Government

Not Applicable.

3.5.3.1 Delivery Government Pick Up

Not Applicable.

3.5.3.2 DD Form 1348-1

Prepare DD Form 1348-1 Turn-in Document (TID), which will accompany the PCB to the storage site. Ensure that a responsible person from the activity that owns the PCB signs the DD Form 1348-1.

-- End of Section --

SECTION 02 85 00.00 20

MOLD REMEDIATION
05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA IMOM08-679	(2008) Recognition, Evaluation, and Control of Indoor Mold

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE Z9.2	(2012) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION CERTIFICATION (IICRC)

IICRC S100	(2002) Standard Reference Guide for Professional Carpet Cleaning
IICRC S500	(2006) Standard and Reference Guide for Professional Water Damage Restoration

NATIONAL AIR DUCT CLEANERS ASSOCIATION (NADCA)

ACR	(2013) Standard for Assessment, Cleaning, and Restoration of HVAC Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection
29 CFR 1926.1101	Asbestos

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS 1.2.1

AIHA

American Industrial Hygiene Association.

1.2.2 AFU

Air filtration unit with High Efficiency particulate air (HEPA) filtered vacuum and / or exhaust ventilation equipment with a filter system capable of collecting and retaining microbial contamination ASSE Z9.2. Filters shall retain 99.97 percent of particles 1.2 by 10-6 inch or larger as indicated in UL 586.

1.2.3 Categories of Water

(IICRC S500) Category 1 Water: Water originating from a source that does not pose substantial harm to humans. Also referred to as "clean water."

Category 2 Water: Water containing a significant degree of chemical, biological and/or physical contamination and having the potential to cause discomfort or sickness if consumed by or exposed to humans. Also referred to as "gray water."

Category 3 Water: Grossly unsanitary water, containing pathogenic agents, arising from sewage or other contaminated water sources and having the likelihood of causing discomfort or sickness if consumed by or exposed to humans. This category includes all forms of seawater, ground surface water and rising water from rivers or streams. Also referred to as "black water."

1.2.4 Certified Industrial Hygienist (CIH)

A Certified Industrial Hygienist refers to an individual that has been certified by the American Board of Industrial Hygiene (ABIH), with professional qualifications and experience as required for an industrial hygienist, as presented in the definition of "Industrial Hygienist."

1.2.5 Complete Interior Building Demolition (Complete Gut)

Interior finishes of the building have been removed to expose basic structural elements.

1.2.6 Containment

Physical separation and engineering controls required to prevent contamination of undamaged materials and occupied areas. The level of containment varies depending on the extent of the contamination.

1.2.6.1 Source Containment

Use when the contaminated surface area is less than 10 square feet, in non-residential buildings only. At a minimum, source containment shall include the following:

a. Isolation of Work Areas. Install polyethylene barriers to isolate the areas or material to be demolished / remediated from non-remediation areas.

b. Floor protection. Maintain protection for finished floors through all construction activities.

c. HEPA vacuum to control dust created during the demolition. Hold HEPA vac intake at source of dust.

1.2.6.2 Limited Containment

Use when contaminated surface area is between 10 square feet and 100 square feet per room in non-residential buildings and contaminated surface area less than 100 square feet per room in residential buildings. At a minimum, limited containment shall include the following:

a. Containment. For residential buildings, a containment shall include the entire room where work is being performed. The containment shall not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment shall include the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Install polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column maximum relative to the outside and other adjacent spaces not undergoing remediation. AFUs shall filter a minimum of four air changes per hour and a maximum of six air changes per hour.

e. Protection for all items remaining in the containment. Protective devices shall prevent physical damage (e.g., scratches and dents) and shall provide a positive seal to prevent dust from settling in or on the items.

f. Containment Entrance. Install a triple-flap poly "door" to be used during demolition to minimize egress and provide a good separation between containment and occupied areas of the house / building.

1.2.6.3 Full Containment

Use when contaminated surface area is greater than 100 square feet in both residential and nonresidential buildings. At a minimum, full containment shall include the following:

a. Containment. For residential buildings, a containment shall include the entire room where work is being performed. The containment shall not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment shall include the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Construct polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column maximum relative to the outside and other adjacent spaces not undergoing remediation. AFUs shall filter a minimum of four air changes per hour and a maximum of six air changes per hour.

e. Protection for all items remaining in the containment. Protective devices shall prevent physical damage (e.g., scratches and dents) and shall provide a positive seal to prevent dust from settling in or on the items.

f. Decontamination. Construct a decontamination airlock for entry into and exit from the work area. The airlock shall be used to HEPA vacuum the sealed bags of contaminated debris. When possible, the decontamination airlock shall be located so that the sealed bags can be passed directly from the airlock to the outside, through a door or window.

g. Containment Entrance. Install a triple-flap poly "door" at the entrance to the airlock, and between the airlock and the work area during demolition to minimize egress and provide a good separation between containment and occupied areas of the house / building.

1.2.6.4 Unoccupied Building Containment

Use when a building is unoccupied and large amounts of mold growth are present throughout the building:

a. Containment. The containment consists of the entire building. Install AFUs with HEPA filters in the building. Configure the AFUs to recirculate within the active remediation area. AFUs shall filter a minimum of four air changes per hour and a maximum of six air changes per hour based on the size of the area undergoing active remediation.

b. Isolation of Work Areas. Install polyethylene barriers to isolate the areas where remediation is not required. AFU discharge may be used to positively pressurize non-remediation areas from areas undergoing remediation to prevent the movement of spores into "clean" areas.

c. Floor Protection. Maintain protection for finished floors through all construction activities.

d. Protection for all items remaining in the containment. Protective devices shall prevent physical damage (e.g., scratches and dents) and shall provide a positive seal to prevent dust from settling in or on the items.

e. Decontamination. Construct a decontamination airlock for entry into and exit from the building.

f. Containment Entrance. A triple-flap poly "door" shall be used at the entrance to the work area during demolition to minimize egress.

1.2.6.5 Cleaning Containment

A temporary containment structure set up to clean items removed from the containment. At a minimum, the cleaning area shall contain:

a. Two chambers. Construct walls with polyethylene. Items will be cleaned in the first chamber. The clean items shall be stored in the second chamber.

b. Air Filtration / Pressurization Control Cleaning Chamber. Install AFUs with HEPA filters in the cleaning chamber. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column (maximum) relative to the storage chamber.

c. Air Filtration, Storage Chamber. Install AFUs with HEPA filters in the storage chamber. The AFUs shall be configured to allow air to recirculate within the chamber. AFUs shall filter a minimum of four air changes per hour and a maximum of six air changes per hour.

d. Containment Entrance. Install a triple-flap poly "door" at the entrance to the cleaning chamber, between the cleaning and storage chambers, and at the exit of the storage chamber to minimize egress and provide a good separation between the chambers.

1.2.7 Decontamination Unit (Airlock)

An enclosed area adjacent to, and connected to, a regulated work area. It consists of various rooms that are used for the decontamination of workers, equipment, and materials.

1.2.8 Dehumidifier

Mechanism or machine to remove moisture from the air.

1.2.9 Detergent

A cleaning agent. The term refers to a prepared compound that may include surfactants, builders, dry solvents, softeners, etc, but does not include true soap.

1.2.10 Disinfectants or Biocide Sanitizing Solutions

One of three groups of antimicrobials registered by the EPA for public health uses. The EPA considers an antimicrobial to be a disinfectant when it destroys or irreversibly inactivates infectious or other undesirable organisms, but not necessarily their spores.

1.2.11 EPA

U.S. Environmental Protection Agency.

1.2.12 Fungicidal Agents, (EPA)

A coating material that contains an EPA registered fungicide that inhibits the spread and growth of mold with the ability to withstand moist and humid conditions.

1.2.13 HEPA Filter

A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of all particulate larger than 1.2 by 10-6 inch.

1.2.14 HVAC

Heating, Ventilating, and Air Conditioning (System).

1.2.15 Industrial Hygienist (IH)

Industrial Hygienist (IH) refers to an individual designated and provided by the Contractor that is a professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational and indoor air quality hazards. Education must include a minimum 12 semester hours or quarter hour equivalent of chemistry and 18 additional semester hours or quarter hour equivalent of courses in any combination of chemistry, physics, engineering, health physics, environmental health, biostatistics, biology, physiology, toxicology, epidemiology, or industrial hygiene. The Industrial Hygienist shall be under the supervision of a Certified Industrial Hygienist.

1.2.16 Microbial Remediation Supervisor

Individual responsible for the execution of the microbial remediation work as defined by the scope of work. This individual shall have documented training in microbial remediation and have at least three years experience in microbial remediation work. Remediation contractor's on-site supervisor shall have one of the following certifications: Council-Certified Mold Remediator (CMR), or Council-Certified Mold Remediation Supervisor (CMRS) as certified by the American Council for Accredited Certification, or Applied Microbial Remediation Specialist (AMRS), Institute of Inspection, Cleaning, and Restoration Certification (IICRC) or Contracting Officer approved equivalent.

1.2.17 Non-Porous Material

A material that does not absorb nor is easily penetrated by liquids, especially water. Generally, non-porous materials have a permeable factor of less than 1. Some examples are metal, glass, plastic, ceramic tile, etc.

1.2.18 Occupied Spaces (Areas)

The phrase "occupied space" within this specification refers to spaces that are occupied by unprotected non-remediation personnel while work is in progress. It also refers to areas adjacent to work areas that are not currently undergoing remediation.

1.2.19 Personal Protective Equipment (PPE)

Any material or device worn to protect a worker from exposure to, or contact with, any harmful material or force. PPE must be cleaned or disposed of prior to removal from the remediation work area.

1.2.20 Poly

Polyethylene sheet with a minimum thickness of 6 mils.

1.2.21 Porous Material

Permeable materials having the physical properties that allow liquids or gasses to pass through. These materials include but are not limited to the following: gypsum wall board, insulation, wallpaper, ceiling material, carpet, padding, paper goods (i.e., cardboard boxes, loose paper, books, etc.), stuffed furniture, wicker, fabrics, etc.

1.2.22 Pressure Differential Measuring Instrument

Device used to measure the relative pressure difference between the work area and areas outside the work area. For mold remediation, the device must measure accurately in the 0 to 0.04 inch range.

1.2.23 Semi-porous Material

A material that can absorb liquids if exposed over long periods of time. These materials include but are not limited to wood, concrete, linoleum, vinyl wall covering, wooden or hardboard furniture, plaster, etc.

1.2.24 Ventilation System Mold Remediator Qualifications (VSMR)

An individual certified by the North American Duct Cleaning Association (NADCA) to clean HVAC systems.

1.2.25 Work Area

The area where remediation operations are actively performed and controlled to prevent the spread of dust / spores and entry by unauthorized personnel. A work area is the space, group of spaces, or the building, as defined by the Microbial Assessment Survey.

1.3 REQUIREMENTS

1.3.1 Description of Work

The Contracting Officer will furnish the Contractor, in the contract documents, an initial Microbial Assessment Survey with containment categories and remediation methods specified for each work area and material within the work area.

The Contracting Officer's initial Microbial Assessment Survey specified below shall be furnished and certified by a qualified assessor authorized by the Contracting Officer to do such work. The initial survey is included in the solicitation documents at the end of this specification section.

Provide mold remediation work including the handling and control of mold contaminated materials and the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with mold products and spores. The work also includes the disposal of any mold contaminated materials generated by the work. The mold removal work includes the demolition and removal of approximately 10,000 SF of mold impacted drywall (in some cases double layer drywall)/ceiling tiles from the perimeter walls (and in some cases internal walls and ceilings) of the first floor north and east sides of the building. This work shall be coordinated with the interior demolition specifications and architectural demolition specifications and drawings.

Provide containment and engineering control techniques as outlined in this specification. All mold contaminated material removal work shall be supervised by a microbial remediation supervisor as specified herein.

No work in this specification section shall be provided by any person, contractor, or contracting entity involved in the preparation of the contract documents of which this specification section is a part.

The following microbial remediation specifications apply to the cleaning / removal and disposal of fungally-contaminated porous, semi-porous and non-porous surfaces within various types of structures. The level of containment and requirements for cleaning and remediation of materials will depend on the condition of the space and materials being remediated.

Immediately after award of the contract, prepare a preliminary visual assessment report using the standard microbial assessment form (Appendix A) to document the differences in the pre-remediation condition of the work areas as compared to the government provided Microbial Assessment Survey. Only address the differences between the pre-remediation condition of the work areas and the government provided Microbial Assessment Survey. If required to indicate the differences, include the HVAC systems inspection required elsewhere in this specification section. Submit this written pre-remediation condition report to the Contracting Officer for approval and instructions to proceed.

After approval of the preliminary visual assessment report and having instructions from the Contracting Officer to proceed, prepare a microbial remediation plan for approval by the Contractor's Certified Industrial Hygienist. Microbial remediation plan shall include an assessment of the risk for people to occupy areas adjoining the remediation area while remediation work is occurring. Upon the Contractor's CIH approval of the plan, submit the plan to the Contracting Officer for approval.

The Contractor's CIH or IH shall monitor the site on a daily basis while remediation work is in progress, identifying work and/or work practices that are not in compliance with the approved microbial remediation plan, and performing all inspections required by this specification. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the contract.

This specification section includes the protocol regarding proper disposal of the removed building material components from within the work site.

Use proper cleaning procedures, engineering controls, and apply best management practices to remove microbial growth and spore fallout from all surfaces and building materials to minimize the further release of microbial spores. Address semi-porous and nonporous surfaces within the facility in each cleaning phase of the project. Damp wipe and HEPA vacuum all surfaces, at a minimum. Remove and dispose of porous building materials that are supporting microbial growth.

1.3.2 Security Requirements

Prior to granting access to any work area (i.e., building, area, room, or space) for mold remediation work, a determination must be made by the government agency whether classified or controlled unclassified information (paper material and / or electronic media) or equipment is contained in the work area(s).

If Contractor personnel require access to classified information or spaces to perform mold remediation work, the Government must issue the Contractor facility a DD Form 254 (Contract Security Classification Specification) prior to the initiation of the work under the contract. If the Contractor facility does not possess a valid DD Form 254 issued by the Defense Security Service (DSS), the Government will be required to submit a sponsorship request to DSS requesting that the Contractor be processed for and issued a current DD Form 254 at the appropriate level.

Access to classified information (paper material, electronic media, and equipment) must only be granted to authorized and appropriately cleared government and U.S. contractor personnel that possess a personnel security clearance commensurate with the level of information contained in the work area that requires a mold remediation effort.

Access to Controlled Unclassified information (i.e., For Official Use Only, Sensitive but Unclassified, Privacy Act Information, Export Controlled unclassified, etc.) can be granted to DOD cleared contractors, consultants and grantees that are conducting official business for the DOD or DON. Non-cleared U.S. contractor personnel who only require access to controlled unclassified information can be granted access if they get a favorable trustworthiness determination on an individual Facility Access Determination National Agency Check (FADNAC) submitted on their behalf by the government agency issuing the contract.

Classified information and controlled unclassified information must be safeguarded / secured, reproduced, and destroyed in accordance with SECNAV M-5510.36.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preliminary Visual Assessment Report; G

Microbial Remediation Plan; G

Worker Records; G

Respiratory Protection Program; G

Certified Industrial Hygienist (CIH)/Industrial Hygienist (IH) Qualifications; G

Microbial Remediation Supervisor Qualifications; G

Ventilation System Mold Remediator Qualifications (VSMR); G

SD-03 Product Data

Personal Protective Equipment (PPE); G

Air Filtration Units; G

Dehumidifiers; G

Pressure Differential Measuring Instrument; G

Fungicidal Agents, (EPA); G

Disinfectants or Biocide Sanitizing Solutions; G

SD-06 Test Reports

Daily Reports; G

SD-11 Closeout Submittals

Submittals at Completion of Remediation Work; G

1.4.1 Preconstruction Submittals

Within ten (10) days from the award of the contract and prior to the start of the work, submit to the Contracting Officer and NAVSTA NPT Environmental Office six copies of the following items for review and permanent file.

1.4.1.1 Preliminary Visual Assessment Report

A written report to document the pre-remediation condition of the work areas compared to the government provided Microbial Assessment Survey and the results of the HVAC systems inspection.

1.4.1.2 Microbial Remediation Plan

Submit a job-specific, detailed plan Approved by the Contractor's CIH to the Contracting Officer and NAVSTA NPT Environmental Office for final approval prior to start of work. The plan shall address the following items at a minimum:

a. Description of materials to be remediated, providing location and quantities (map of locations of mold and proposed work area lay outs), and methods to be used for remediation.

b. Types of biocides and fungicidal agents, (EPA).

c. Containment procedures to include description and locations of engineering controls and decontamination unit to include entry and exit procedures (provide sketch of floor plan showing location of containment barriers and decontamination units). Plan shall include locations of AFUs and AFU discharges to the outside.

d. Description of personal protective equipment to be used during the remediation.

e. Construction barricades and barriers in occupied areas.

f. HVAC Shut down and start-up procedures.

g. HVAC Evaluation and remediation procedures.

h. Moisture and relative humidity control procedures and equipment.

i. Packaging and disposal procedures.

j. Safety Precautions to include lockout / tag-out, fall protection, confined space entry procedures, and fire protection.

k. Description of the method to be employed to control cross contamination of areas not in the work area. This shall include a risk assessment related to the suitability of people to occupy areas adjoin the remediation area while remediation activities are ongoing.

l. IH Quality Control procedures to include visual inspection.

m. Procedures to control, abate, and dispose of Asbestos Containing Materials (ACM) and Lead Based Paint (LBP) coincident with microbial remediation. Before work in areas containing ACM and PACM is begun; Contractor shall identify the presence, location, and quantity of ACM, and/or PACM therein pursuant to paragraph (k)(1) of 29 CFR 1926.1101.

1.4.1.3 Respiratory Protection Program

Provide written copy of Contractor's Respiratory Protection program.

1.4.1.4 Worker Records

Provide the following documents for all workers, including supervisory personnel. If new workers are added to the crew, provide the same documentation for them.

Employee Instruction and Release Form: Provide documentation showing that each employee has been instructed on the following items:

a. Use and fit of respirators (for employees entering and working in the containment).

b. Protective clothing.

c. Protective measures.

d. Safety and Emergency Egress Procedures.

e. Site specific fall protection plan and training.

f. Microbial remediation hazards and practices including engineering controls and isolation. Training should include "hands on" training for microbial remediation supervisors.

g. Workers' release forms stating the potential hazards involved with the scope of the work.

Worker Training Certification: Submit copies of training certificates for each employee indicating that the employee has received training at the appropriate level for the work prescribed in the description of work.

1.4.1.5 Certified Industrial Hygienist (CIH)/Industrial Hygienist (IH) Qualifications

Submit the name, address, and telephone number of the Certified Industrial Hygienist (CIH) and Industrial Hygienist (IH). Provide copies of board

certificates, resume to document field experience, and evidence that the CIH and IH have successfully completed training in microbial investigation and remediation.

1.4.1.6 Microbial Remediation Supervisor Qualifications

Onsite supervisor shall have one of the following certifications: Certified Mold Remediator (CMR), Certified Mold Remediation Supervisor (CMRS), or Applied Microbial Remediation Specialist (AMRS). Submit copies of supervisory training certificates.

1.4.2 Product Data

Within 10 days of contract award, submit product data for items identified for use in Microbial Remediation Plan.

1.4.3 Daily Reports

Prepare a written report for each day that microbial remediation work is being accomplished. Submit this report to the Contracting Officer by 1000 hours of the following day, attached to the Contractor Quality Control Report. Referred to collectively as the IH Daily Report, the report at a minimum shall include measurements of differential pressure and temperature and relative humidity in work areas, and detail any non-compliance issues observed.

1.4.4 Submittals at Completion of Remediation Work

Within 14 days of completion, provide the following information:

a. Supervisor Logs.

b. IH Daily Reports.

c. Photographic Logs.

d. Contractor's Industrial Hygienist Report certifying the microbial remediation is complete.

1.5 RECORD KEEPING

A Daily Project Log shall form a permanent record of the project. Secure and maintain these logs and any other required documentation as part of the permanent project file.

1.5.1 Daily Log

The Microbial Remediation Supervisor shall maintain a Daily Project Log. The Daily Project Log shall be used each day of the project to document the following information.

a. Date.

b. Name of Microbial Remediation Supervisor.

c. Name of Industrial Hygienist monitoring work area.

d. Number of workers on site.

e. Equipment utilized.

f. Brief description of daily work activities.

g. Listing of any non-compliance noted, emergencies, stop work orders (with detailed explanation), exhaust system pressure differential recordings and descriptions of any other significant events.

PART 2 PRODUCTS

2.1 DISINFECTANTS, BIOCIDES, SANITIZING SOLUTIONS AND FUNGICIDAL AGENTS, (EPA)

Shall be approved by EPA for the use detailed in the Microbial Remediation Plan and used in accordance with the manufacturer's specifications.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide protective clothing and respirators as required by the Microbial Remediation Plan for use by any authorized visitors. Provide manufacturer's certificate of compliance for all equipment used to contain the microbial contamination. Contractor shall not be required to certify that visitors entering work areas be capable of wearing respirators.

3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services. Provide personnel engaged in set-up, pre-cleaning, cleanup, handling, and removal of contaminated materials with the appropriate respiratory protection as specified in 29 CFR 1910.134. Microbial remediation plan shall consider Table 17.1 in AIHA IMOM08-679 "Recognition, Evaluation, and Control of Indoor Mold", which lists the minimum levels of respiratory protection based on the activity and size of the remediated area.

3.1.2 Protective Clothing

Provide all workers with protective clothing as appropriate for the work being accomplished, as required by the Microbial Remediation Plan.

Do not permit any person to enter the work area without the appropriate protective clothing and equipment.

3.1.3 Warning Signs and Labels

Provide bilingual warning signs printed in English and Spanish at all approaches to the work areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Warning signs may be in the form of continuous plastic tape. The warning signs shall have black characters on a yellow background.

WARNING
DO NOT ENTER
MICROBIAL REMEDIATION WORK IN PROGRESS

Alternate wording for the warning signs will be approved by the Contracting Officer.

3.1.4 Dehumidifiers

Install and use dehumidifiers as needed during the remediation and during reconstruction to maintain relative humidity below 50 percent in the work area. Drain the condensate water to a permanent drain, or empty as needed to prevent water overflowing from the dehumidifiers.

3.1.5 Air Filtration Units (AFU)

Install and use AFUs with HEPA filters, and manufacturer specified pre-filters, as part of the exhaust ventilation system to develop and maintain the specified desired air pressure differential inside the enclosed work area relative to the outside areas. The Contractor shall be responsible for acquiring and paying for any licenses needed for use of any equipment, including but not limited to, air pressure differential systems and air filtration systems.

Replace HEPA filters and pre-filters for AFUs as required to maintain pressurization performance requirements during demolition and cleaning. Do not reuse filters. Bag used filters at a minimum in clear 6 mil polyethylene bags within the containment and disposed as contaminated waste.

Discharge air from any AFUs located in the work area containment to the outside environment when creating a negative pressure containment to create a negative pressure relative to occupied areas of 0.02 inch H2O to 0.04 inch H20. Discharge air in excess of that required for creating the proper negative pressure to the work area. The AFUs shall provide four to six air changes per hour in the work area. Under no circumstances may air from AFUs discharge to an occupied area. Coordinate location of window sashes or doors required for discharge openings with the Contracting Officer. Seal around openings used for discharge of exhaust air airtight. Exhaust discharge openings may be constructed of plywood.

Seal all exhaust and intake openings in AFUs with one layer of 6 mil polyethylene sheeting when not in use.

3.1.6 Vacuum Cleaners Equipped with HEPA Filters

Provide vacuum cleaners equipped with HEPA filters designed for continuous operation to perform the work in a timely and efficient manner.

Provide nozzle attachments as required to adequately remove all dust. As a minimum, nozzle attachments shall include crevice and extended bristle brush nozzles. Any vacuum that is not equipped with a HEPA filter shall not be used at anytime.

Provide sufficient vacuum cleaners equipped with HEPA filters designed for continuous operation in the work area during microbial remediation inside the containment area.

Provide additional vacuum cleaners equipped with HEPA filters in the enclosed work area during remediation or cleaning work as required by the size (area) of the containment and to maintain timely progress of the work.

3.2 GENERAL REQUIREMENTS

3.2.1 Pre-Microbial Remediation Work Conference

Meet with the Contracting Officer and NAVSTA NPT Environmental Office prior to beginning work to discuss in detail the Microbial Remediation Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan shall be enforced as if a part of this specification. Any variances to the specification as a result of the plan shall be specifically identified to allow for free discussion and approved by the Contracting Officer in writing prior to starting work. Before work in areas containing Asbestos Containing Material (ACM) and Presumed Asbestos Containing Materials (PACM) and Lead is begun, Contractor shall identify the presence, location, and quantity of ACM, PACM and Lead. Ensure proper notification of regulatory authorities. Contractor shall consult with Contracting Officer to obtain facility ACM / LBP surveys.

3.2.2 Containment Entry / Exit Procedure

Ensure that each worker and authorized visitor follows entry and exit procedures detailed in the Microbial Remediation Plan.

3.3 REMOVAL PROCEDURES

3.3.1 Protection of Existing Work Areas

Perform work in a manner to minimize the damage or contamination to areas outside or directly adjacent to the work area. Contractor is required to inspect areas inside and outside proposed work areas to identify existing damage and notify Contracting Officer prior to start of work.

Where materials outside work area are damaged or contaminated as a result of the Contractors work efforts as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting officer. Should adjacent or outside areas become contaminated as a result of the Contractors work efforts the work shall stop immediately. The newly contaminated areas shall be cleaned and verified by visual inspection by the IH. The work may proceed at the discretion of the Contracting Officer once the area has been verified as restored.

3.3.2 Remediation of Fungally Contaminated Building Materials

The removal of contaminated materials shall follow in general the listed sequence of work. The Contractor may make changes to improve work flow with the approval of the Contracting Officer.

a. Provide level of containment and PPE required by the Microbial Remediation Plan.

b. Disable all HVAC units and exhaust fans in the area to be remediated.

c. Protect materials to remain in work area. Where possible, all materials to be salvaged should be cleaned in place to prevent possible cross-contamination created by moving materials through non-remediation areas.

d. Remove undamaged items and materials to be cleaned and salvaged from

the work area. Materials shall be stored in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items prior to removal.

e. Set up containments, including protection of materials remaining within the containment and AFUs. Notify Contracting Officer that the area is prepared for remediation activities.

f. Pre-demolition inspection by the Contracting Officer.

g. Demolition and removal of contaminated materials.

h. Post-remediation inspection by the Contracting Officer.

i. Perform final cleaning in the containment.

j. Clean carpet in the containment or in this case remove and dispose of carpet as C&D waste.

k. Clearance inspection by the Contracting Officer.

l. Duct and HVAC cleaning, if necessary.

m. Deconstruction of containment, removal of AFUs.

n. Clean previously removed items prior to returning to occupied area.

3.3.3 Remediation Procedures

Procedures for remediation depend on the amount of mold growth and the type of material with fungal growth.

3.3.3.1 Remediation of Non-Porous Materials

The method of remediating non-porous items shall be:

a. HEPA vacuum all surfaces.

b. Damp wipe all surfaces using clean water or a detergent solution.

3.3.3.2 Semi-Porous Materials (Unfinished Wood)

The method of remediating unfinished wood-based items, including wood and wood framing in wall cavities, shall be:

a. Cleaning:

1. HEPA vacuum all surfaces.

2. Scrub surfaces with a brush and detergent to remove mold.

3. HEPA vacuum all surfaces to remove dust.

4. Repair finishes as required to match original.

b. Removal:

1. Where unfinished wood product has been structurally damaged,

remove and replace with an equivalent product. This shall include wall studs and sheathing, such as OSB used in flooring, wall, or roof construction.

3.3.3.3 Semi-Porous Materials

The method of surface cleaning semi-porous materials such as concrete, vinyl wall covering, linoleum, leather furniture, and finished wood products shall be:

a. HEPA vacuum all surfaces.

b. Damp wipe surfaces with using clean water or a detergent solution. Avoid over-wetting the material.

3.3.3.4 Porous Materials

a. Carpet:

1. Removal: Replace carpet that has remained wet for 48 hours or longer.

2. Cleaning: Use a dry absorbent compound cleaning method as designated by IICRC S100. This method uses an absorbent compound to dissolve, suspend and absorb carpet soils. It does not add moisture back into the carpet.

b. Gypsum Wallboard (GWB):

1. Removal: Replace Gypsum Wallboard that has remained wet for 48 hours or longer, or has visible mold growth. Where removal of GWB exposes insulation, remove and replace the insulation with an insulation having equal characteristics for insulating value and permeability.

2. Surface Cleaning: Where GWB has a small amount of surface mold growth and the GWB is structurally sound, a surface cleaning method may be used with the permission of the Contracting Officer. The method of surface cleaning GWB shall be HEPA vacuum all surfaces. Surface cleaning shall not be used where mold growth penetrates wallboard substrate.

c. Ceiling Tile:

1. Removal: Replace ceiling tile that has remained wet for 48 hours or longer, or has visible mold growth.

2. Surface Cleaning: Where settled dust on ceiling tiles contains mold spores and the ceiling tile is structurally sound, is not sagging, and has not been wet, a surface cleaning method may be used with the permission of the Contracting Officer. The method of surface cleaning ceiling tile shall be HEPA vacuum all surfaces. Surface cleaning shall not be used where mold growth is occurring on ceiling tiles.

d. Paper Materials:

Contractor personnel cannot be granted access to classified information and / or Controlled Unclassified Information until they have met the

security requirements stated in the paragraph SECURITY REQUIREMENTS.

1. Removal: Discard paper materials that have remained wet for 48 hours or longer, or that have visible mold growth. Classified and Controlled Unclassified Information must be destroyed by appropriately cleared contractor personnel using an approved DOD destruction method that is authorized for the specific level of information.

2. Containment: Where paper materials, such as personnel records must be retained, the following containment methods may be used with the permission of the Contracting Officer. The method of containment for paper products shall be:

   (a) Thoroughly dry the paper material. Classified and Controlled Unclassified Information must be safeguarded at all times in a GSA approved security container, restricted area, vault, or under the direct physical control of appropriately cleared contractor personnel.

   (b) Where routine access to the material is required, a copy shall be made. Contractor personnel shall not reproduce copies of classified information or controlled unclassified information without the prior written approval of the Contracting Officer and the NAVFAC LANT security department. If approval is obtained, only appropriately cleared Contractor personnel shall be authorized to reproduce the information and they must use only DOD authorized reproduction equipment.

   (c) When not in use, the classified and controlled unclassified information must be secured in an approved GSA security container, restricted area, or vault. Limit access to the container to only appropriately cleared Contractor personnel. Implement an access procedure involving opening the container in a secure area with provision for capturing mold spores and respiratory protection for workers opening the container for these materials. Store the container in an area where the relative humidity is maintained below 60 percent to prevent further mold growth.

e. Textiles:

1. Discard textiles with visible mold growth.

2. Clean textile based items, including clothing, linens, and toys that do not have visible mold growth, but have been wet, in standard commercial or residential washing machines with standard washing machine detergent.

3. Dry all items completely before returning to the building / house.

   (a) When possible, use dryers to dry items.

   (b) If dryers will cause irreversible harm to the item, hang the item on a drying rack in a temperature and humidity controlled space. Discard items not dry within 48 hours.

f. Upholstered Furniture:

1. Removal: Discard upholstered furniture that has remained wet for

48 hours or longer, or that have visible mold growth.

2. Cleaning: Clean upholstered furniture that has been exposed to mold spores but does not have visible mold growth by HEPA vacuuming upholstery and wood or metal structure, followed by a damp wipe of semi-porous or non-porous portions of the furniture.

3.4 DETAILED SEQUENCE OF WORK FOR MOLD REMOVAL UNDER CONTAINMENT

3.4.1 Preparation for Remediation Work

a. Provide level of containment and PPE required for the remediation based on the Microbial Remediation Plan.

b. Disable all HVAC units and exhaust fans in the area to be remediated.

c. Remove undamaged materials from the work area if they are to be salvaged but cannot be cleaned in place. Store materials in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items prior to removal. Clean materials using procedures detailed in Remediation Procedures.

d. Remove supply diffusers, return grilles and exhaust grilles. Clean diffusers and grilles using procedures detailed in Remediation Procedures.

e. Construct containment barriers. Existing walls can be used as a portion of the containment barriers if existing openings in walls (such as doors, wall openings, vents, etc.) are sealed using polyethylene.

f. Install the AFUs and dehumidifiers.

g. Seal supply, return, and exhaust openings with polyethylene sheeting and protect intakes to air handling units. Air handling units shall remain off.

h. Install all equipment needed for removal work in the containment area to minimize egress during demolition.

i. The Contracting Officer will inspect the containment to verify that the containment is properly constructed and the containment area has an overall negative pressure of 0.02 to 0.04 inch water column relative to the outside and adjacent work areas not undergoing active remediation, prior to beginning demolition work.

3.4.2 Demolition

a. Remove mold contaminated materials to be discarded, such as paper, and furniture. Double bag material in 6 mil poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible, pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building / house.

b. Remove contaminated gypsum wallboard (GWB) at the preliminary limits of demolition specified in the Microbial Remediation Plan. Inspect

back side of removed GWB. If mold is observed on the back side of the GWB, report this condition to the Contracting Officer. After obtaining Contracting Officer approval, continue removing GWB until no mold is observed. If hidden mold is discovered that will extend past the extents of the containment, stop work immediately and reconstruct the containment to extend past the suspected contamination. Re-evaluate level of containment and PPE. Continue to operate AFUs during reconfiguring of containment.

c. Remove drywall by cutting in pieces as large as possible to minimize aerosolization of fungal spores. Drywall screws can either be backed out during removal or later during cleanup.

d. Use dust collection attachments on all power tools, such as sanders, saws, etc., to capture dust created when using the tools. Outlet of dust collector should discharge into inlet of AFU.

e. Remove fiberglass insulation behind removed gypsum board.

f. If wood studs are contaminated, scrub them with a brush and detergent to remove mold. Replace wood studs with damage severe enough to reduce the structural capacity of the member. Prior to removal of any structural member consult with the Contracting Officer.

g. Clean all metal framing with a dilute detergent solution. Clean metal framing with light rust using steel wool and coat with a rust inhibiting paint. Replace metal framing with rust damage severe enough to reduce the structural capacity of the member. Prior to removal of any structural material, consult with the Contracting Officer.

h. Remove contaminated carpet scheduled for removal.

i. Place removed gypsum board, insulation, carpet and remaining debris in two layers of 6 mil poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building / house. Remediation workers shall HEPA vacuum their PPE, then remove them within the airlock chamber. Discard disposable coverall suits into a 6 mil poly bag.

3.4.3 Post-Demolition Inspection

a. The Contracting Officer will inspect the containment area to verify that all contaminated materials have been removed.

b. Allow a minimum of 12 hours after completion of removal work, with AFUs operating, for airborne dust in the containment to settle and / or be removed by the AFUs.

3.4.4 Cleaning after Demolition, and Cleaning of Settled Spores from Porous / Non-Porous Materials

a. Continue to operate AFUs during cleaning.

b. Clean exposed surfaces.

1. HEPA vacuum all surfaces.

2. Damp wipe all non-porous exposed surfaces including polyethylene sheets used to protect materials, external surfaces of ductwork, studs, and floors with clean rag and clean potable water or detergent solution.

3. Remove poly sheeting inside the containment.

4. HEPA vacuum all surfaces protected by poly sheeting.

5. Damp wipe non-porous surfaces protected by poly sheeting with clean water or a detergent solution.

6. Clean carpet using procedures in Remediation of Fungally Contaminated Building Materials.

c. Final clearance inspection will be conducted by Contracting Officer. Clearance inspections will be performed using the procedures detailed in Post-Remediation Inspection. Maintain containments in place until spaces are inspected and accepted by the Government as being fully remediated. The Government will determine whether the Contractor shall conduct additional cleaning and repeat the clearance process.

3.5 DUCT AND HVAC SYSTEM CLEANING

3.5.1 Contractor Qualifications

a. The HVAC cleaning contractor shall be a certified member of NADCA.

b. The HVAC cleaning contractor shall have at least one individual with Ventilation System Mold Remediator Qualifications certified by NADCA onsite during duct and HVAC system cleaning.

3.5.2 Inspection

IH shall visually inspect the HVAC system serving all work areas (or as required in the initial Microbial Assessment Survey performed by the Government), and determine if additional remediation is needed to clean the HVAC system, thus preventing re-contamination. Notify the Contracting Officer of the inspection results. The Contractor must receive written approval from the Contracting Officer before proceeding with HVAC microbial remediation.

a. Follow requirements of the NADCA ACR "Standard for Assessment, Cleaning, and Restoration of HVAC Systems".

b. Using a "gassing" or "fogging" method of cleaning with gaseous chlorine dioxide or ozone will not be allowed.

c. Disable all HVAC equipment prior to cleaning any component of the system.

d. The method of cleaning the air handling units, terminal units, blowers and exhaust fans shall be:

1. Construct a limited containment around equipment to be cleaned. Provide appropriate PPE for workers.

2. Remove filters. Seal filters in 6 mil poly bags for disposal.

3. Disassemble units as necessary to clean components. Contractor is responsible for reassembling equipment after cleaning.

4. Clean disassembled components within the containment or in a separate two chamber cleaning containment. Seal disassembled components in 6 mil poly bags for transport out of building / house.

5. HEPA vacuum all surfaces.

6. Damp wipe all non-porous surfaces and components with clean water or a detergent solution.

e. The method of cleaning HVAC coils shall be:

1. Clean coils using a method which will render the coil visibly clean. Coil cleaners shall be non-acidic / alkaline, detergent based. Clean condensate drain pans. The drain for the condensate drain pan shall be operational during the cleaning.

2. Rinse coils and drain pans with clean water to remove any latent residues.

3. Cleaning methods shall not cause damage to the coil surface or fins.

4. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil shall be considered clean only if the coil is free of foreign matter and chemical residue.

f. The method of cleaning the duct system shall be:

1. During cleaning, connect a vacuum collection system to the downstream end of the section being cleaned. The vacuum collection device must be of sufficient power to render all areas of duct being cleaned under negative pressure relative to rooms and areas of duct not being cleaned. Negative pressure must be verified at the furthest point from the collection system with a micromanometer and verification measurements included in the Daily Report.

2. Equip the vacuum collection systems with HEPA filters. Exhaust the vacuum collection systems directly to the outside.

3. Use mechanical agitation devices to dislodge debris adhered to the ductwork, such that debris may be safely conveyed to vacuum collection devices. Cleaning methods shall not damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork.

4. HEPA vacuum duct surfaces.

5. When possible, damp wipe metal duct surfaces with clean water or detergent solution. Do not wet fibrous glass thermal or acoustical insulation.

6. Identify areas where there is evidence of damage to or uncleanable mold in duct insulation. The Contracting Officer will make the decision to discard the insulation, if necessary.

g. Final clearance of HVAC and duct system will be based on a visual assessment (no visible dust, no visible mold) by Contracting Officer.

3.6 FIRE PROTECTION

The Contractor shall provide portable fire extinguishers within the containment area and outside the decontamination unit. Fire extinguishers shall be rated for the class of fire hazards in the work area and shall be sized for coverage of the areas within the containment. At a minimum, one 10 pound ABC fire extinguisher for every 1,000 square feet shall be strategically placed around the containment. Personnel shall be trained for emergency egress and the use of fire extinguishers. Notify fire officials of work activities as required.

3.7 CONSTRUCTION BARRIERS

a. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain. Shoring, bracing or support will be necessary when structural wood studs or metal framing need to be removed and replaced when they cannot be cleaned.

b. Do not disturb microbial-contaminated building materials while isolating work areas. This precaution prevents the release of microbial spores.

c. Workers shall wear respirators and other PPE as outlined in the microbial remediation plan when installing critical barriers where microbial contaminated surfaces (walls or surfaces with visible settled dusts) are likely to be disturbed. Operate an AFU if disturbance is likely during setup.

d. Monitor the air pressure differential across work area containments. The monitoring system shall be in place before the start of remedial activities. Verification by the Industrial Hygienist is required prior to the start of the microbial remediation.

3.8 QUALITY ASSURANCE / QUALITY CONTROL REQUIREMENTS

3.8.1 Contractor Qualifications

Work shall be performed by a qualified remediation contractor. Contractor shall carry insurance that specifically covers mold remediation.

Remediation contractor's on-site supervisor shall have one of the following certifications: Certified Mold Remediator (CMR), Certified Mold Remediation Supervisor (CMRS), or Applied Microbial Remediation Specialist (AMRS). Qualified supervisor shall be onsite whenever active remediation is being performed. Set-up activities may be performed without supervisor present; qualified supervisor shall review set-up prior to start of work.

Mold remediation workers shall be given training in PPE and mold remediation activities as required for their particular job. Microbial remediation plan shall provide details of worker training.

3.8.2 Waste Management and Removal

Keep the site and work area free from accumulations of dust, waste materials, or rubbish caused by Contractor operations and free from any flammable materials or other sources of fire hazard. Remove all waste materials and rubbish from and about the work site in strict accordance with the specifications and applicable codes and regulations.

3.8.3 Post-Remediation Inspection

Clean up all debris and dust in interior spaces outside the work area resulting from the Contractor's remediation work.

After all visible accumulations of material and debris are removed from the containment, provide the Contracting Officer a 24-hour notice for a final clearance visual inspection. The Contracting Officer and Contractor's Industrial Hygienist shall conduct a thorough visual inspection of the work area. If during this inspection any visible debris and/or microbial contamination are observed, the Contractor shall re-clean the work area without additional cost to the Government.

3.8.3.1 Clearance

a. Clearance Criteria:

   1. Clearance will be based on visual assessment (all visible mold removed, all visible dust removed, based on a "white glove" test) by Contracting Officer. "White glove" test shall consist of wiping the surface with a clean cloth of color suitable to reveal expected type of dust. For most surfaces, a white cloth is suitable. For GWB dust, a dark cloth may be more appropriate.

b. Failed remediation areas will be recleaned and the AFUs kept in operation another 12 hours, followed by another visual assessment. Subsequent failures will follow the same routine until a pass condition is secured.

3.9 CLEAN-UP AND DISPOSAL

3.9.1 Disposal of Material

Dispose of contaminated bagged waste materials removed during this remediation as general construction debris. Follow all applicable local, State, and Federal requirements for the disposal of this material.

3.9.2 Material Packaging

Place waste, as waste is removed, into a disposal container promptly. Disposal containers shall consist of at a minimum, two layers of clear 6 mil polyethylene bags. Tape bags in a gooseneck fashion to form an airtight seal and label appropriately. Bag waste from vacuums equipped with HEPA filters in 6 mil polyethylene bags.

3.9.3 Building Exit (Waste Disposal)

HEPA vacuum and damp wipe bags of contaminated waste material prior to removal from the building.

3.9.4 Hazardous Material

Should the Contractor encounter any hazardous materials, notify the Contracting Officer immediately for direction.

3.10 Appendices

Appendix A - Microbial Assessment Visual Field Report Form
Appendix B - Sample Mold Remediation Clearance Criteria For Buildings Housing Sensitive Populations

Appendix A

Microbial Assessment Visual Field Report Form

TO DOWNLOAD THIS FORM, SEE UFGS GRAPHICS
Go to http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.

Appendix B

Sample Mold Remediation Clearance Criteria
For Buildings Housing Sensitive Populations

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
05/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 301	(2010; ERTA 2015) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(1996; R 2008) Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 306R	(2010) Guide to Cold Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI 318	(2014; Errata 1-2 2014; Errata 3-4 2015) Building Code Requirements for Structural Concrete and Commentary
ACI 347	(2004; Errata 2008; Errata 2012) Guide to Formwork for Concrete
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References

ACI SP-2	(2007; Abstract: 10th Edition) ACI Manual of Concrete Inspection
ACI SP-66	(2004) ACI Detailing Manual

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2015) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615/A615M	(2015a) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A934/A934M	(2013) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2015) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C1107/C1107M	(2014a) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1157/C1157M	(2011) Standard Specification for Hydraulic Cement
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C143/C143M	(2012) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2015) Standard Specification for Portland Cement
ASTM C1567	(2013) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2012) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete

ASTM C172/C172M	(2014a) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C192/C192M	(2015) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231/C231M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295/C295M	(2012) Petrographic Examination of Aggregates for Concrete
ASTM C31/C31M	(2012) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C311/C311M	(2013) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
ASTM C33/C33M	(2013) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2015a) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2013) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C494/C494M	(2013) Standard Specification for Chemical Admixtures for Concrete
ASTM C578	(2015) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C595/C595M	(2015; E 2015) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C78/C78M	(2015a) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C881/C881M	(2014) Standard Specification for Epoxy-Resin-Base Bonding Systems for

	Concrete
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM C94/C94M	(2015) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2014) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2004a; R 2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D2628	(1991; R 2011) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2012) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D5759	(2012) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2012) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E329	(2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2009; 28th Ed) Manual of Standard Practice

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation

or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, granulated blast-furnace slag, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.

e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.

f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.

g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.

h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.

i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Plan; G

Quality Control Personnel Certifications; G

Quality Control Organizational Chart

Laboratory Accreditation; G

SD-02 Shop Drawings

Reinforcing Steel; G

SD-03 Product Data

Joint Sealants

Joint Filler

Cementitious Materials

Concrete Curing Materials

Reinforcement

Admixtures

Epoxy Grout

SD-05 Design Data

Concrete Mix Design; G

SD-06 Test Reports

Concrete Mix Design; G

Fly Ash

Pozzolan

Ground Granulated Blast-Furnace Slag

Aggregates

Compressive Strength Tests; G

Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Material Safety Data Sheets

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Curing Compound

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, complementary cementitious materials, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, complementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Shop Drawings

1.6.2.1 Reinforcing Steel

ACI SP-66. Indicate bending diagrams, assembly diagrams, splicing and

laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.6.3 Control Submittals

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.6.3.2 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.6.3.3 Material Safety Data Sheets

Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. MSDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.4.2 Ground Granulated Blast-Furnace Slag

Submit test results in accordance with ASTM C989/C989M for ground granulated blast-furnace slag. Submit test results performed within 6 months of submittal date.

1.6.4.3 Aggregates

ASTM C1260 for potential alkali-silica reactions, ASTM C295/C295M for petrographic analysis.

1.6.5 Quality Control Plan

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.6 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the

Contractor.

Submit American Concrete Institute certification for the following:

a. CQC personnel responsible for inspection of concrete operations.

b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.

c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.6.6.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five (5) similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.6.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.

b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.

c. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.6.7 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.8 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.

b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by ASTM C31/C31M.

c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

a. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.

b. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, plastic, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

2.1.1 Wood Forms

Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining. Submit data verifying that composite wood products contain no urea formaldehyde resins. Virgin wood used must be FSC-certified.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

Provide a form tie system that does not leave mild steel after break-off or removal any closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Rigid Insulation

Perimeter insulation must be polystyrene conforming to ASTM C578, Type VI; 4-inch thickness.

2.3 CONCRETE MIX DESIGN

2.3.1 Contractor-Furnished Mix Design

ACI 211.1, ACI 301, ACI 318, and ACI 304.2R except as otherwise specified. Indicate the compressive strength (f'c) of the concrete for each portion of the structure(s) as specified below. Where faster set time is required, use Type III cement before using calcium chloride with approval from the contracting officer.

2.3.1.1 Footings and Foundation Walls

Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 3000 psi at 28 days.

b. Maximum Water-Cementitious Materials Ratio: 0.50.

c. Slump Limit: 4 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

d. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

e. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch and 3/4-inch nominal maximum aggregate size.

2.3.1.2 Slab-on-Grade and Suspended Slabs

Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4000 psi at 28 days.

b. Maximum Water-Cementitious Materials Ratio: 0.45.

c. Slump Limit: 4 inches or 8 inches for concrete with verified slump of

2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

d. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

e. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch or 3/4 inch nominal maximum aggregate size.

f. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.3.1.3 Mix Proportions for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and air content suitable for the work on methodology described in ACI 211.1. In the trial mixture, use at least three different water-cementitious material ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cementitious material ratio allowed must be based on equivalent water-cementitious material ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan by weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cementitious material ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M for 7, 28, 90 days. From these results, plot a curve showing the relationship between water-cementitious material ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7 and 28 day strengths.

2.3.1.4 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI 301, but may not exceed the specified strength at the same age by more than 20 percent. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI 301.

2.3.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the

following information in addition to that required by ASTM C94/C94M:

a. Type and brand cement.

b. Cement and complementary cementitious materials content in 94-pound bags per cubic yard of concrete.

c. Maximum size of aggregate.

d. Amount and brand name of admixtures.

e. Total water content expressed by water cementitious material ratio.

2.3.3 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2. Submit product data for concrete curing compounds. Submit manufactures instructions for placement of curing compound.

2.4 MATERIALS

2.4.1 Cementitious Materials

For exposed concrete, use one manufacturer and one source for each type of cement, ground slag, fly ash, and pozzolan.

2.4.1.1 Fly Ash

ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 3 percent. Class F fly ash for use in mitigating Alkali-Silica Reactivity must have a Calcium Oxide (CaO) content of less than 8 percent and a total equivalent alkali content less than 1.5 percent.

Add with cement. Fly ash content must be a minimum of 15 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.4.1.2 Raw or Calcined Natural Pozzolan

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and must have an ignition loss not exceeding 3 percent. Class N pozzolan for use in mitigating Alkali-Silica Reactivity must have a Calcium Oxide (CaO) content of less than 13 percent and total equivalent alkali content less than 3 percent.

2.4.1.3 Ultra Fine Fly Ash and Ultra Fine Pozzolan

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

c. The sum of SiO_2 + Al_2O_3 + Fe_2O_3 must be greater than 77 percent.

2.4.1.4 Ground Granulated Blast-Furnace Slag

ASTM C989/C989M, Grade 120. Slag content must be a minimum of 25 percent by weight of cementitious material.

2.4.1.5 Portland Cement

Provide cement that conforms to ASTM C150/C150M, Type I or II, low alkali with tri-calcium aluminates (C_3A) content less than 10 percent and a maximum cement-alkali content of 0.80 percent Na_2O_e (sodium oxide) equivalent. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

2.4.1.6 Blended Cements

Blended cement must conform to ASTM C595/C595M and ASTM C1157/C1157M, Type IP or IS, including the optional requirement for mortar expansion and sulfate soundness and consist of a mixture of ASTM C150/C150M Type I, or Type II cement and a complementary cementing material. The slag added to the Type IS blend must be ASTM C989/C989M ground granulated blast-furnace slag. The pozzolan added to the Type IP blend must be ASTM C618 Class F and must be interground with the cement clinker. The manufacturer must state in writing that the amount of pozzolan in the finished cement will not vary more than plus or minus 5 mass percent of the finished cement from lot-to-lot or within a lot. The percentage and type of mineral admixture used in the blend must not change from that submitted for the aggregate evaluation and mixture proportioning.

2.4.2 Water

Water must comply with the requirements of ASTM C1602/C1602M. Minimize the amount of water in the mix. Improve workability by adjusting the grading rather than by adding water. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete. Submit test report showing water complies with ASTM C1602/C1602M.

2.4.3 Aggregates

ASTM C33/C33M, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Provide aggregates that do not contain any substance which may be deleteriously reactive with the alkalies in the cement. Submit test report showing compliance with ASTM C33/C33M.

Fine and coarse aggregates must show expansions less than 0.08 percent at 28 days after casting when testing in accordance with ASTM C1260. Should the test data indicate an expansion of 0.08 percent or greater, reject the aggregate(s) or perform additional testing using ASTM C1567 using the Contractor's proposed mix design. In this case, include the mix design

low alkali portland cement and one of the following supplementary cementitious materials:

a. GGBF slag at a minimum of 40 percent of total cementitious

b. Fly ash or natural pozzolan at a minimum of total cementitious of

1. 30 percent if (SiO_2 plus Al_2O_3 plus Fe_2O_3) is 65 percent or more,

2. 25 percent if (SiO_2 plus Al_2O_3 plus Fe_2O_3) is 70 percent or more,

3. 20 percent if (SiO_2 plus Al_2O_3 plus Fe_2O_3) is 80 percent or more,

4. 15 percent if (SiO_2 plus Al_2O_3 plus Fe_2O_3) is 90 percent or more.

If a combination of these materials is chosen, the minimum amount must be a linear combination of the minimum amounts above. Include these materials in sufficient proportion to show less than 0.08 percent expansion at 28 days after casting when tested in accordance with ASTM C1567.

Aggregates must not possess properties or constituents that are known to have specific unfavorable effects in concrete when tested in accordance with ASTM C295/C295M.

2.4.4 Nonshrink Grout

ASTM C1107/C1107M.

2.4.5 Admixtures

ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures. Submit product data for admixtures used in concrete.

2.4.5.1 Air-Entraining

ASTM C260/C260M.

2.4.5.2 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C494/C494M, Type F and Type G (HRWR retarding admixture) and ASTM C1017/C1017M. HRWR must come from the same manufacturer.

2.4.6 Epoxy Grout

ASTM C881/C881M, Type IV, Grade 3, except gel times.

2.4.7 Expansion/Contraction Joint Filler

ASTM D1751 or ASTM D1752 Type I or II. Material must be 1/2 inch thick, unless otherwise indicated.

2.4.8 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.8.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.8.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T.

2.4.8.3 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.8.4 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.9 Biodegradable Form Release Agent

Provide form release agent that is colorless, biodegradable, and water-based, with a low (maximum of 55 grams/liter (g/l) VOC content. A minimum of 85 percent of the total product must be biobased material. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

2.5 REINFORCEMENT

2.5.1 Reinforcing Bars

ACI 301 unless otherwise specified. Use deformed steel. ASTM A615/A615M with the bars marked A, Grade 60. Reinforcing bars may contain post-consumer or post-industrial recycled content. Submit mill certificates for reinforcing bars.

2.5.2 Wire

2.5.2.1 Welded Wire Reinforcement

ASTM A1064/A1064M. Wire reinforcement may contain post-consumer or post-industrial recycled content. Provide flat sheets of welded wire reinforcement for slabs and toppings.

2.5.2.2 Steel Wire

Wire must conform to ASTM A1064/A1064M.

2.5.3 Reinforcing Bar Supports

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.

Provide wire bar type supports of coated or non-corrodible material conforming to ACI SP-66 and CRSI 10MSP.

Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

Plastic and steel may contain post-consumer or post-industrial recycled content.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are level.

If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

When subgrade material is semiporous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Subgrade Under Slabs on Ground

Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials.

Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

3.2.4 Edge Forms and Screed Strips for Slabs

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must

be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

Provide forms, shoring, and scaffolding for concrete placement in accordance with ACI 301 Section 2 and 5 and ACI 347. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris.

3.3.1 Coating

Before concrete placement, coat the contact surfaces of forms with a form release agent.

3.3.2 Reuse

Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.

3.3.3 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.4 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view.

3.3.5 Form Ties

Provide ties in accordance with ACI 301 section 2.

3.3.6 Tolerances for Form Construction

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI 301 Section 5 and ACI 117.

3.3.7 Removal of Forms and Supports

After placing concrete, removal of forms must be in accordance with ACI 301 Section 2 except as modified by approved form removal schedule.

3.4 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301 and ACI SP-66. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.4.1 General

Provide details of reinforcement that are in accordance with ACI 301 and ACI SP-66 and as specified.

3.4.2 Rigid Insulation

Install rigid insulation under slabs in 4-inch layers at locations indicated.

3.4.3 Reinforcement Supports

Support reinforcement in accordance with ACI 301 Section 3. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least 2 inches beyond the point of contact with the bars.

3.4.4 Splicing

As indicated. For splices not indicated ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.

3.4.5 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.4.6 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

a. Provide fabrication tolerances that are in accordance with ACI 318 and ACI SP-66.

b. Provide hooks and bends that are in accordance with ACI 318 and ACI SP-66.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI SP-66.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.4.7 Placing Reinforcement

Place reinforcement in accordance with ACI 301 and ACI SP-66.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 318, ACI SP-66 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

a. Equip supports on ground and similar surfaces with sand-plates.

b. Support welded wire reinforcement as required for reinforcing bars.

c. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

d. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI SP-66.

e. Bending of reinforcing bars partially embedded in concrete is

permitted only as specified in ACI SP-66 and ACI 318.

3.4.8 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI 318 and ACI SP-66.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.4.9 Concrete Protection for Reinforcement

Concrete protection must be in accordance with the ACI 318 and ACI SP-66.

3.4.10 Setting Dowel with Epoxy Grout

At locations where reinforcing dowels are set in existing concrete, set dowels in holes with epoxy grout in accordance with grout manufacturer's printed instructions.

3.5 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.5.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.5.2 Mixing

ASTM C94/C94M, ACI 301 and ACI 304R. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: If set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cementitious material ratio are not exceeded and the required concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

3.5.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.6 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5.

3.6.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.6.2 Pumping

ACI 304R and ACI 304.2R. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.6.3 Cold Weather

ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.6.4 Hot Weather

Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.6.5 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.7 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.7.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.7.2 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.7.3 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material. Return excess cement to supplier.

3.8 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.8.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.8.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.8.3 Formed Surfaces

3.8.3.1 Tolerances

ACI 117 and as indicated.

3.8.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.8.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.8.4 Smooth-Rubbed Finish

Provide a smooth-rubbed finish per ACI 301 Section 5 at exposed to view locations.

3.9 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly as indicated. Where straightedge measurements are specified, Contractor must provide straightedge.

3.9.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.9.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with ACI 301 Section 5 for a scratched finish.

3.9.1.2 Floated

Use for exterior slabs where not otherwise specified. Finish concrete in accordance with ACI 301 Section 5 for a floated finish.

3.9.1.3 Steel Troweled

Use for floors intended as walking surfaces and for reception of floor coverings. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.9.1.4 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.9.2 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints one inch deep with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10 JOINTS

3.10.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints.

3.10.2 Isolation Joints in Slabs on Ground

Provide joints at points of contact between slabs on ground and vertical surfaces, such as walls and elsewhere as indicated.

Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.10.3 Contraction Joints in Slabs on Ground

Provide joints to form panels as indicated.

Under and on exact line of each control joint, cut 50 percent of welded wire reinforcement before placing concrete.

Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.

Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles.

3.10.4 Sealing Joints in Slabs on Ground

Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

Sealed groove must be left ready to receive filling material that is

provided as part of finish floor covering work.

3.11 CURING AND PROTECTION

ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.11.1 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.11.2 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.11.3 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.11.4 Curing Unformed Surfaces

Accomplish initial curing of unformed surfaces, such as monolithic slabs and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.11.5 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain

temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.11.6 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.11.7 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.12.2 Testing

3.12.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.12.2.3 Compressive Strength Tests

ASTM C39/C39M. Make six 6 inch by 12 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7

days, two cylinders at 28 days, and hold two cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 100 cubic yards of concrete for the first 500 cubic yards, then every 500 cubic yards thereafter, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of ACI 318 Section 5.6. Retest locations represented by erratic core strengths. Where retest does not meet concrete compressive strength requirements submit a mitigation or remediation plan for review and approval by the contracting officer. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.12.2.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.12.2.5 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

a. Failure to meet compressive strength tests as evaluated.

b. Reinforcement not conforming to requirements specified.

c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.

d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.

e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.

f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.12.2.6 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate

or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.12.2.7 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

b. Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

d. Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.13 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.13.1 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.13.2 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL
05/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2010) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2011) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 341	(2010) Seismic Provisions for Structural Steel Buildings
AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2015) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A6/A6M	(2014) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM C1107/C1107M	(2014a) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C827/C827M	(2010) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM C881/C881M	(2014) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM F1554	(2007a; E 2011) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329	(2013) Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F844	(2007a; R 2013) Washers, Steel, Plain (Flat), Unhardened for General Use

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2013; Change 1) Structural Engineering
UFC 3-310-04	(2013) Seismic Design for Buildings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Erection Drawings; G

SD-02 Shop Drawings

Fabrication drawings including description of connections; G

SD-03 Product Data

Adhesive for Post-Installed Anchor Rods

Welding electrodes and rods

Non-Shrink Grout

SD-06 Test Reports

Bolts, nuts, and washers

SD-07 Certificates

Steel

Bolts, nuts, and washers

Galvanizing

Welding procedures and qualifications

Welding electrodes and rods

1.3 QUALITY ASSURANCE

1.3.1 Preconstruction Submittals

1.3.1.1 Erection Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303. Erection drawings must be reviewed, stamped and sealed by a registered professional engineer.

1.3.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Any deviations from the details shown on the contract drawings must be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.3.3 Certifications

1.3.3.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing must be provided in accordance with AISC 360, AISC 341, UFC 3-301-01 and UFC 3-310-04 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Angles, Channels and Plates, ASTM A36/A36M.

2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade C.

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.3.1.2 Nuts

ASTM A563M, Grade A, heavy hex style.

2.3.1.3 Washers

ASTM F844.

2.3.2 Post-Installed Anchor Rods

2.3.2.1 Anchor Rods

ASTM F1554 Gr 36, Class 2A.

2.3.2.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.2.3 Anchor Washers

ASTM F844.

2.3.2.4 Anchor Plate Washers

ASTM A36/A36M.

2.3.3 Adhesive for Post-Installed Anchor Rods

ASTM C881/C881M Type IV Grade 3 Epoxy Resin Adhesive. Use Class suitable for temperature of the surface of the hardened concrete at time of application.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout must be nonmetallic.

2.5 GALVANIZING

ASTM F2329 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

2.6.1 Markings

Prior to erection, members must be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

PART 3 EXECUTION

3.1 ERECTION

a. Erection of structural steel, must be in accordance with the applicable provisions of AISC 325.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Material must be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, connections not detailed must be designed in accordance with AISC 360. Build connections into existing work. Do not tighten anchor rods set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

ASTM A307 bolts must be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 Post-Installed Anchor Rods

Set anchor rods in existing concrete using adhesive for post-installed anchor rods in accordance with adhesive manufacturer's printed instructions. Tighten nuts to "snug tight" fit.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified must be submitted for approval.

3.5 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.6 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. The Contracting Officer must be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.6.1 Welds

3.6.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections.

Inspect proper preparation, size, gaging location, and acceptability of welds; identification marking; operation and current characteristics of welding sets in use.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S200	(2007) North American Standard for Cold-Formed Steel Framing - General Provision
AISI S201	(2007) North American Standard for Cold-Formed Steel Framing - Product Data
AISI S202	(2011) Code of Standard Practice for Cold-formed Steel Structural Framing
AISI S211	(2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design
AISI S212	(2007) North American Standard for Cold-Formed Steel Framing - Header Design
AISI S213	(2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design
AISI SG02-KIT	(2001; Supp 1 2004) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1003/A1003M	(2013b) Standard Specification for Steel

	Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1007	(2011a) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2013) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM C955	(2011c) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
ASTM E119	(2012a) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E329	(2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F1941M	(2007) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Metric)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components; G

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

Steel studs, joists, tracks, bracing, bridging and accessories

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to job site and store in adequately ventilated, dry locations. Storage area shall permit easy access for inspection and handling. If necessary to store materials outside, stack off the ground, support on a level platform, and protect from the weather as approved. Handle materials to prevent damage. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust. Replace damaged items with new, as directed by the Contracting Officer. Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

1.4 MAXIMUM DEFLECTION

a. Exterior Studs:

Deflection Criteria	Exterior Finish
L/240 or L/360	Synthetic Plaster, Metal Panels
L/360	Cement Plaster, Wood Veneer
L/600	Brick Veneer, Stone Panels

Wall deflections shall be computed on the basis that studs withstand all lateral forces independent of any composite action from sheathing materials. Studs abutting windows or louvers shall also be designed not to exceed 1/4 inch maximum deflection.

b. Floor Joists:

L/360 - Live load only
L/240 - Total load

c. Roof Rafters:

L/240 - Live load only

1.5 QUALITY ASSURANCE

a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

b. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this project in material, design, and extent.

c. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.

d. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

e. Welding Qualifications: Qualify procedures and personnel according to the following:

    1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

    2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

f. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.

g. AISI Specifications and Standards: Comply with:

    1. AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members."

    2. AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provision."

    3. AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Data."

    4. AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

    5. AISI S211, "North American Standard for Cold-Formed Steel Framing - Wall Stud Design."

    6. AISI S212, "North American Standard for Cold-Formed Steel Framing - Header Design."

    7. AISI S213, "North American Standard for Cold-Formed Steel Framing - Lateral Design."

1.5.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories.

PART 2 PRODUCTS

2.1 STEEL STUDS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

a. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

   1. Grade: ST50H (ST340H).

   2. Coating: G90 (Z275).

b. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A1003/A1003M, ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

   1. Grade: 50 (340).

   2. Coating: G90 (Z275).

c. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

   1. Minimum Base-Metal Thickness: As indicated.

   2. Flange Width: As indicated.

   3. Section Properties: As indicated.

d. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

   1. Minimum Base-Metal Thickness: Matching steel studs.

   2. Flange Width: As indicated.

2.1.1 Studs of 16 Gage (0.0538 Inch) and Heavier

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 50, G90.

2.1.2 Studs of 18 Gage (0.0478 Inch) and Lighter

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 33, G90.

2.1.3 Sizes, Gages, Section Modulus, and Other Structural Properties

Size and gage as indicated.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the

member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

a. An ICC number.

b. Manufacturer's identification.

c. Minimum delivered uncoated steel thickness.

d. Protective coating designator.

e. Minimum yield strength.

2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling, tapping screws in compliance with ASTM C1513 of the type, size and location as shown on the drawings. Electroplated screws shall have a minimum 5 micron zinc coating in accordance with ASTM F1941. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M as appropriate.

2.4 PLASTIC GROMMETS

Supply plastic grommets, recommended by stud manufacturer, to protect electrical wires. Prevent metal to metal contact for plumbing pipes.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling or self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI SG02-KIT. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 18 gage.

3.1.2 Screws

Screws shall be self-drilling self-tapping type, size and location indicated. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI SG02-KIT. Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location shown on the drawings.

3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location shown on the drawings.

3.2 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of partitions. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and AISI SG03-3, consisting of, as a minimum, runner channel cut to fit between and welded to the studs or hot- or cold-rolled steel channels inserted through cutouts in web of each stud and secured to studs with welded clip angles. Bracing shall be not less than the following:

LOAD	HEIGHT	BRACING
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

3.2.3 Erection Tolerances

a. Framing members which will be covered by finishes such as wallboard,

plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:

(1) Layout of walls and partitions: 1/4 inch from intended position;

(2) Plates and runners: 1/4 inch in 8 feet from a straight line;

(3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 1/4 inch in 8 feet from a true plane.

b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

(1) Layout of walls and partitions: 1/4 inch from intended position;

(2) Plates and runners: 1/8 inch in 8 feet from a straight line;

(3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3	(2013) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.21.1	(2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.6.2	(1998; R 2010) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series
ASME B18.6.3	(2013) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014) Standard Specification for Carbon

	Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2015) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	(2015) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B26/B26M	(2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C1513	(2013) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access doors and panels, installation drawings; G

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Access doors and panels

1.3 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A36/A36M.

2.1.2 Structural Tubing

ASTM A500/A500M.

2.1.3 Anchor Bolts

ASTM A307. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.3.1 Toggle Bolts

ASME B18.2.1.

2.1.3.2 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 or ASTM A307.

2.1.3.3 Powder Actuated Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.3.4 Screws

ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.1.3.5 Washers

Provide plain washers to conform to ASME B18.21.1. Provide beveled

washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.1.4 Aluminum Alloy Products

Conform to ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

2.2.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.2.6 Aluminum Surfaces

2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF45. Provide a polished satin finish on items to be anodized.

2.3 ACCESS DOORS AND PANELS (1 HOUR FIRE-RATED)

Provide flush type access doors and panels with flange at gypsum board painted finish wall conditions and recessed type with depressed face for tile application on door panel at tiled wall conditions unless otherwise indicated. Fabricate frames for access doors of steel or aluminum not lighter than 14 gage with welded joints and anchorage for securing into construction. Provide access doors with a minimum of 12 by 12 inches and of not lighter than 14 gage, with stiffened edges and welded attachments. Provide access doors hinged to frame and with a flush-face, turn-screw-operated latch. Provide exposed metal surfaces with a shop-applied prime coat, final paint coat applied in the field.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide

a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations and securely fastened in place. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.6 FINISHES

3.6.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.

3.6.2 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

3.6.3 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

3.7 ACCESS PANELS

In addition to access panels noted on drawings, install a removable access panel not less than 12 by 12 inches directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling and/or inaccessible walls, other than an acoustical ceiling, and that

would otherwise not be accessible.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY
02/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2010) American Softwood Lumber Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man	(2012) Manual for Railway Engineering

AMERICAN WOOD COUNCIL (AWC)

AWC NDS	(2012) National Design Specification (NDS) for Wood Construction
AWC WFCM	(2012) Wood Frame Construction Manual for One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK	(2012) AWPA Book of Standards
AWPA M2	(2011) Standard for Inspection of Treated Wood Products
AWPA M6	(2013) Brands Used on Preservative Treated Materials
AWPA P18	(2014) Nonpressure Preservatives
AWPA P49	(2010) Standard for Fire Retardant FR-1
AWPA P5	(2014) Standard for Waterborne Preservatives
AWPA T1	(2014) Use Category System: Processing and Treatment Standard
AWPA U1	(2014) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.5.2.1M	(2006; R 2011) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2010) Metric Round Head Square Neck Bolts
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM D2898	(2010) Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM F1667	(2013) Driven Fasteners: Nails, Spikes, and Staples
ASTM F547	(2006; R 2012) Nails for Use with Wood and Wood-Base Materials

FM GLOBAL (FM)

FM 4435	(2013) Roof Perimeter Flashing

GREEN SEAL (GS)

GS-36	(2011) Commercial Adhesives

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2011) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2013) Standard Grading Rules for Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use	(1998) Redwood Lumber Grades and Uses

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec	(1986; Supple. No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003	(2002) Standard Grading Rules for Southern Pine Lumber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 2) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 2) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 2) Shield Expansion (Nail Anchors)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2004) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(2011) Western Lumber Grading Rules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nailers and Nailing Strips; G

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

SD-06 Test Reports

Preservative-treated lumber and plywood

SD-07 Certificates

Certificates of grade

Manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

Preservative treatment

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark shall identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall provide Contracting Officer's Representative (COR) with the inspection report of an approved independent

inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber shall be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWPA M6.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products shall be as follows at the time of delivery to the job site:

a. Framing lumber and board, 19 percent maximum.

b. Timbers 5 inches and thicker, 25 percent maximum.

c. Materials other than lumber; moisture content shall be in accordance with standard under which the product is produced.

1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products shall conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products shall not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards.

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood shall be air or kiln dried after treatment. Specific treatments shall be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled

after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. All lumber and woodwork shall be preservative treated.

1.7.1 Existing Structures

Use borate, permathrin, or a sodium silicate wood mineralization process to treat wood. Use borate for interior applications only.

1.7.2 New Construction

Use a boron-based preservative conforming to AWPA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

1.8 FIRE-RETARDANT TREATMENT

Fire-retardant treated wood shall be pressure treated with fire retardants conforming to AWPA P49. Fire retardant treatment of wood products shall conform to the requirements of AWPA U1, Commodity Specification H and AWPA T1, Section H. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, shall receive exterior fire-retardant treatment. Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate, and formaldehyde.

1.9 QUALITY ASSURANCE

1.9.1 Certificates of Grade

Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

1.9.2 Humidity Requirements

Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

1.10 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Virgin Lumber

Lumber fabricated from old growth timber is not permitted. Avoid

companies who buy, sell, or use old growth timber in their operations, when possible.

2.2 LUMBER

2.2.1 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing shall be one of the species listed in the table below. Minimum grade of species shall be as listed.

Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, Ponderosa Pine-Lodgepole Pine, Subalpine Fir, White Woods, Western Woods, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: Standard
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine-Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	Construction Heart
NHLA Rules rules for the measurement and inspection of hardwood and cypress lumber	Cypress	No. 2 Dimension	No. 2 Common

2.3 PLYWOOD

APA L870.

2.3.1 Subflooring

2.3.1.1 Plywood

C-D Grade, Exposure 1 durability classification, Span rating of 24/16 or greater.

2.4 OTHER MATERIALS

2.4.1 Miscellaneous Wood Members

2.4.1.1 Nonstress Graded Members

Members shall include bridging, corner bracing, furring, grounds, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

Member	Size inch
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Corner bracing	1 x 4.
Furring	1 x 2.
Grounds	Plaster thickness by 38.
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

2.4.1.2 Wood Bumpers

AREMA Eng Man, Industrial grade cross ties.

2.4.1.3 Sill Plates

Sill plates shall be standard or number 2 grade.

2.4.1.4 Blocking

Blocking shall be standard or number 2 grade.

2.4.1.5 Rough Bucks and Frames

Rough bucks and frames shall be straight standard or number 2 grade.

2.4.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials, GS-36, SCAQMD Rule 1168, and as specified. Use water-based adhesives with maximum VOC content of 15 grams/liter for all interior applications.

2.5 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials shall be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs shall be hot-dip zinc-coated in accordance with ASTM A153/A153M. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather shall be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.5.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.5.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.5.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices shall be 3/8 inch.

2.5.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.5.5 Wood Screws

ASME B18.6.1.

2.5.6 Nails

ASTM F547, size and type best suited for purpose. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing shall be in accordance with the recommended nailing schedule contained in AWC WFCM. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AWC NDS. Reasonable judgment backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

2.5.7 Wire Nails

ASTM F1667.

2.5.8 Door Buck Anchors

Metal anchors, 1/8 by 1-1/4 inch steel, 12 inches long, with ends bent 2 inches. Anchors shall be screwed to the backs of bucks and built into masonry or concrete. Locate 8 inches above sills and below heads and not more than 24 inches intermediately between.

2.5.9 Metal Bridging

Where not indicated or specified otherwise, No. 16 U.S. Standard gage, cadmium-plated or zinc-coated.

2.5.10 Toothed Rings and Shear Plates

AWC NDS.

PART 3 EXECUTION

3.1 INSTALLATION

Conform to AWC WFCM and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering, unless otherwise indicated or specified. Select lumber

sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise shall be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts shall be drawn up tight. Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

3.1.1 Sills

Set sills level and square and wedge with steel or slate shims; point or grout with non-shrinking cement mortar to provide continuous and solid bearing. Anchor sills to the foundations as indicated. Where sizes and spacing of anchor bolts are not indicated, provide not less than 5/8 inch diameter bolts at all corners and splices and space at a maximum of 6 feet o.c. between corner bolts. Provide at least two bolts for each sill member. Lap and splice sills at corners and bolt through the laps or butt the ends and through-bolt not more than 6 inches from the ends. Provide bolts with plate washers and nuts. Bolts in exterior walls shall be zinc-coated.

3.1.1.1 Anchors in Masonry

Embed anchor bolts not less than 15 inches in masonry unit walls and provide each with a nut and a 2 inch diameter washer at bottom end. Fully grout bolts with mortar.

3.1.1.2 Anchors in Concrete

Embed anchor bolts not less than 8 inches in poured concrete walls and provide each with a nut and a 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend shall be not less than 90 degrees. Powder-actuated fasteners spaced 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Nailing Strips

Provide roof nailing strips for roof decks as specified herein. Apply nailing strips in straight parallel rows in the direction and spacing recommended by roofing supplier. Strips shall be surface applied.

a. Surface-Applied Nailers: Shall be 3 inches wide and of thickness to finish flush with the top of the insulation. Anchor strips securely to the roof deck with powder actuated fastening devices or expansion shields and bolts, spaced not more than 24 inches o.c. On decks with slopes of one inch or more, provide surface applied wood nailers for securing insulation.

3.2.1.2 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.

3.2.1.3 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, and wood nailers bolted to tops of concrete or masonry curbs as indicated, specified, or necessary.

3.2.2 Rough Wood Bucks

Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 8 inches minimum. Place anchors near the top and bottom of the buck and space uniformly at 2 foot maximum intervals.

3.2.3 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.4 Wood Grounds

Provide for fastening wood trim, finish materials, and other items to plastered walls and ceilings. Install grounds in proper alignment and true with an 8 foot straightedge.

3.2.5 Wood Bumpers

Dress to the sizes indicated, and bevel edges. Bore, countersink, and bolt bumpers in place.

3.2.6 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.2.7 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction.

3.3 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements. Typical conversion is as shown:

PRODUCTS	INCH-POUND NOMINAL	METRIC CONVERSION
Sawn lumber	2 by 4	38 by 89 mm
	1 by	19 mm by
Stud Spacing	16 inches	400 mm
	If not 48 inches panel	406 mm
Plywood	48 by 96 inches	1200 mm by 2400 mm

-- End of Section --

SECTION 06 41 16.00 10

LAMINATE CLAD ARCHITECTURAL CASEWORK
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2	(1998) Decorative Laminate Countertops, Performance Standards for Fabricated High Pressure

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI AWS	(2009) Architectural Woodwork Standards

ASTM INTERNATIONAL (ASTM)

ASTM F547	(2006; R 2012) Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2010) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.2	(2009) Medium Density Fiberboard (MDF) for Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets vanities as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, shall be sanded smooth and shall receive a clear finish of polyurethane. Wood finish may be shop finished or field applied in accordance with Section 09 90 00 PAINTS AND COATINGS.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

Installation; G

SD-03 Product Data

Wood Materials; G

Wood Finishes; G

Finish Schedule; G

Certification

SD-04 Samples

Plastic Laminates; G

Cabinet Hardware; G

SD-07 Certificates

Quality Assurance

Laminate Clad Casework

1.4 QUALITY ASSURANCE

1.4.1 General Requirements

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication shall conform to and comply with the custom grade quality standards as outlined in AWI AWS, Section for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Submit a quality control statement which illustrates compliance with and understanding of AWI AWS requirements, in general, and the specific AWI AWS requirements provided in this specification. The quality control statement shall also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

1.4.2 Mock-ups

Prior to final approval of shop drawings, provide a full-size mock-up of a typical vanity, floor cabinet, and wall cabinet, including all components and hardware necessary to illustrate a completed unit with a minimum of one door and one drawer assembly. The completed mock-up shall include countertops and back splashes where specified. The mock-up shall utilize specified finishes in the patterns and colors as indicated in drawings. Upon disapproval, rework or remake the mock-up until approval is secured. Remove rejected units from the job site. Approved mock-up may remain as part of the finished work. Submit shop drawings showing all fabricated casework items in plan view, elevations and cross-sections to accurately indicate materials used, details of construction, dimensions, methods of fastening and erection, and installation methods proposed. Shop drawing casework items shall be clearly cross-referenced to casework items located on the project drawings. Shop drawings shall include a color schedule of all casework items to include all countertop, exposed, and semi-exposed cabinet finishes to include finish material manufacturer, pattern, and color.

1.5 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

1.6 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

a. All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood. Lumber shall be FSC-certified.

2.1.2 Panel Products

2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood plywood, AWI AWS Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

2.1.2.2 Medium Density Fiberboard

Medium density fiberboard (MDF) shall be an acceptable panel substrate where noted on the drawings. Medium density fiberboard shall meet the minimum standards listed in CPA A208.2.

2.2 SOLID POLYMER MATERIAL

Solid surfacing casework components shall conform to the requirements of Section 06 61 16 SOLID POLYMER (SOLID SURFACING) FABRICATIONS.

2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates shall meet the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations shall be as indicated on the drawings. Submit two samples of each plastic laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size. Plastic laminate types and nominal minimum thicknesses for casework components shall be as indicated in the following paragraphs.

2.3.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

2.3.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate shall be 0.028 inch (plus or minus 0.004 inch) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

2.3.3 Cabinet Liner Standard (CLS) Grade

Cabinet liner standard grade plastic laminate shall be 0.020 inch in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

2.3.4 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness shall be 0.020 inch. Backing sheets shall be provided for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

2.4 EDGE BANDING

Edge banding for casework doors and drawer fronts shall be PVC vinyl and shall be 0.020 inch thick. Material width shall be 15/16 inch. Color and pattern shall match exposed door and drawer front laminate pattern and color.

2.5 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, and drawer glides. All hardware shall conform to ANSI/BHMA A156.9, unless otherwise noted, and shall consist of the following components:

2.5.1 Adjustable Shelf Support System

Recessed (mortised) metal standards, BHMA No. BO4071, finish: 626.

Support clips for the standards shall be closed type, BHMA No. B04081, finish: 626.

2.6 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type best suited for the purpose and shall conform to ASTM F547 where applicable.

2.7 ADHESIVES, CAULKS, AND SEALANTS

2.7.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

2.7.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use polyvinyl acetate resin emulsion. Adhesives shall withstand a bond test as described in ANSI/WDMA I.S.1A. Adhesives shall contain no added urea-formaldehyde.

2.7.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgebanding shall be adhered using a polymer-based hot melt glue. Adhesives shall contain no added urea-formaldehyde.

2.7.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

2.7.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.8 FABRICATION

Verify field measurements as indicated in the shop drawings before fabrication. Fabrication and assembly of components shall be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed the requirements for AWI custom grade unless otherwise indicated in this specification. Cabinet style, in accordance with AWI AWS, Section 400-G descriptions, shall be as indicated on the drawings.

2.8.1 Base and Wall Cabinet Case Body

2.8.1.1 Cabinet Components

Frame members shall be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms shall be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components shall be constructed from the following materials and thicknesses:

a. Body Members (Ends, Divisions, Bottoms, and Tops):

1. 3/4 inch medium density fiberboard (MDF) panel product.

b. Face Frames and Rails:

1. 3/4 inch hardwood lumber.

c. Shelving:

1. 3/4 inch medium density fiberboard (MDF) panel product.

d. Cabinet Backs:

1. 1/4 inch medium density fiberboard (MDF) panel product.

e. Drawer Sides, Backs, and Subfronts:

1. 1/2 inch hardwood lumber.

f. Drawer Bottoms:

1. 1/4 inch medium density fiberboard (MDF) panel product.

g. Door and Drawer Fronts:

1. 3/4-inch medium density fiberboard (MDF) panel product.

2.8.1.2 Joinery Method for Case Body Members

a. Tops, Exposed Ends, and Bottoms:

1. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

b. Exposed End Corner and Face Frame Attachment:

1. Non-Mitered Joint (90 degree).

(a) Butt joint glued under pressure (no visible fasteners).

c. Cabinet Backs (Wall Hung Cabinets):

1. Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method shall be:

d. Side Bound:

1. Side bound, captured in groove or rabbetts; glued and fastened.

e. Cabinet Backs (Floor Standing Cabinets):

1. Side Bound:

(a) Side bound, captured in grooves; glued and fastened to top and bottom.

2.8.2 Cabinet Floor Base

Floor cabinets shall be mounted on a base constructed of 3/4 inch fiberboard. Base assembly components shall be a moisture-resistant panel product. Finished height for each cabinet base shall be as indicated on the drawings. Bottom edge of the cabinet door or drawer face shall extend below the top of the base as indicated on the drawings.

2.8.3 Cabinet Door and Drawer Fronts

Door and drawer fronts shall be fabricated from 3/4 inch medium density fiberboard (MDF). All door and drawer front edges shall be surfaced with high pressure plastic laminate, color and pattern to match exterior face laminate.

2.8.4 Drawer Assembly

2.8.4.1 Drawer Components

Drawer components shall consist of removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

2.8.4.1.1 Drawer Sides and Backs For Laminate Finish

1/2 inch thick 7-ply hardwood veneer core substrate.

a. Drawer Bottom:

1. 1/4 inch thick veneer core panel product for transparent or plastic laminate finish.

2.8.4.2 Drawer Assembly Joinery Method

a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.

2.8.5 Shelving

2.8.5.1 General Requirements

Shelving shall be fabricated from 3/4 inch medium density fiberboard (MDF). All shelving top and bottom surfaces shall be finished with HPDL plastic laminate. Shelf edges shall be finished in a HPDL plastic laminate.

2.8.5.2 Shelf Support System

The shelf support system shall be:

a. Recessed (Mortised) Metal Shelf Standards:

1. Mortise standards flush with the finishes surface of the cabinet interior side walls, two per side. Position and space standards on the side walls to provide a stable shelf surface that eliminates tipping when shelf front is weighted. Install and adjust standards vertically to provide a level, stable shelf surface when clips are in place.

2.8.6 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible. Fabrication shall conform to ANSI A161.2. Laminate types and grades for component surfaces shall be as follows unless otherwise indicated on the drawings:

2.8.6.1 Base/Wall Cabinet Case Body

a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.

b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: HPDL Grade CLS.

2.8.6.2 Adjustable Shelving

a. Top and Bottom Surfaces:

1. HPDL Grade HGS.

b. All Edges:

1. HPDL Grade VGS.

2.8.6.3 Fixed Shelving

a. Top and Bottom Surfaces:

1. HPDL Grade HGS.

b. Exposed Edges:

1. HPDL Grade VGS.

2.8.6.4 Door, Drawer Fronts, Access Panels

a. Exterior (Exposed) and Interior (Semi-Exposed) Faces:

1. HPDL Grade VGS.

b. Edges:

1. HPDL Grade VGS.

2.8.6.5 Drawer Assembly

All interior and exterior surfaces: HPDL Grade CLS.

2.8.6.6 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces shall meet the AWI AWS custom grade requirements.

2.8.7 Finishing

2.8.7.1 Filling

No fasteners shall be exposed on laminated surfaces. All nails, screws, and other fasteners in non-laminated cabinet components shall be countersunk and the holes filled with wood filler consistent in color with the wood species.

2.8.7.2 Sanding

All surfaces requiring coatings shall be prepared by sanding with a grit and in a manner that scratches will not show in the final system.

2.8.7.3 Coatings

Types, method of application and location of casework finishes shall be in accordance with the finish schedule, drawings and Section 09 90 00 PAINTS AND COATINGS. All cabinet reveals shall be painted. Submit descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc., not clearly illustrated on the submitted shop drawings. Data shall provide written verification of conformance with AWI AWS for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator shall submit available literature which describes re-cycled product content, operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall comply with applicable requirements for AWI AWS custom quality standards. Countertops and fabricated assemblies shall be installed level, plumb, and true to line, in locations shown on the drawings. Cabinets and other laminate clad casework assemblies shall be attached and anchored securely to the floor and walls with mechanical

fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Base cabinets shall utilize a floor anchoring system. Anchoring and mechanical fasteners shall not be visible from the finished side of the casework assembly. Cabinet assemblies shall be attached to anchored bases without visible fasteners. Where assembly abuts a wall surface, anchoring shall include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Cabinet to be wall mounted shall utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

3.1.2 Countertops

Countertops shall be installed in locations as indicated on the drawings. Countertops shall be fastened to supporting casework structure with mechanical fasteners, hidden from view. All joints formed by the countertop or countertop splash and adjacent wall surfaces shall be filled with a clear silicone caulk. Loose back and side splashes shall be adhered to both the countertop surface perimeter and the adjacent wall surface with adhesives appropriate for the type of materials to be adhered. Joints between the countertop surface and splash shall be filled with clear silicone caulk in a smooth consistent concave bead. Bead size shall be the minimum necessary to fill the joint and any surrounding voids or cracks.

3.1.3 Hardware

Casework hardware shall be installed in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with particleboard or fiberboard doors, the use of plastic or synthetic insertion dowels shall be used to receive 3/16 inch "Euroscrews." The use of wood screws without insertion dowels is prohibited.

3.1.4 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with AWI AWS custom grade requirements.

3.1.5 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

-- End of Section --

SECTION 06 61 16

SOLID POLYMER (SOLID SURFACING) FABRICATIONS
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2010) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2008; E 2013) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM E84	(2014) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2013) Determining Resistance of Synthetic Polymeric Materials to Fungi

CSA GROUP (CSA)

CSA B45.5-11/IAPMO Z124	(2011; Update 1 2012) Plastic Plumbing Fixtures - First Edition

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NSF INTERNATIONAL (NSF)

NSF/ANSI 51	(2012) Food Equipment Materials

1.2 SYSTEM DESCRIPTION

a. Work under this section includes countertops and other items utilizing solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of

finished work would be affected.

b. In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to ensure that necessary structural wall support, cabinet countertop structural support, proper clearances, and other supporting components are provided for the installation of wall panels, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer.

c. Appropriate staging areas for solid polymer fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Installation; G

SD-03 Product Data

Solid polymer material

Qualifications

Fabrications

Certification

VOC Content

Engineered Quartz

SD-04 Samples

Material; G

Counter and Vanity Tops; G

SD-06 Test Reports

Solid polymer material

SD-07 Certificates

Fabrications

Qualifications

SD-10 Operation and Maintenance Data

Clean-up

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

1.4.2 Mock-ups

Submit Detail Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work. Prior to final approval of shop drawings, provide a full-size mock-up of a typical vanity top countertop where multiple units are required. The mock-up shall include all solid polymer components required to provide a completed unit. The mock-up shall utilize finishes in patterns and colors indicated on the drawings. Should the mock-up not be approved, re-work or remake it until approval is secured. Remove rejected units from the job site. Approved mock-up may remain as part of the finished work.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.6 WARRANTY

Provide manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

PART 2 PRODUCTS

2.1 MATERIAL

Solid Surface:

Provide solid polymer material that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting CSA B45.5-11/IAPMO Z124 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall

material be less than 1/4 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4,000 psi (max.)	ASTM D638
Hardness	55-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	0.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	
1/2 inch sheet	140 inches, 1/2 lb ball, no failure	
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications

shall be those indicated on the project drawings. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20.

2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the product manufacturer or shall be products approved by the product manufacturer for use with the materials being specified.

2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned solid polymer materials are being bonded together.

2.2.2 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Use sealant to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

2.2.3 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 FABRICATIONS

Components shall be factory or shop fabricated to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer material, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

2.3.1 Joints and Seams

Form joints and seams between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter and Vanity Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be in conformance with dimensions and shapes as indicated on the drawings. Backsplashes and end splashes shall be provided for all counter tops and vanity tops. Backsplashes shall be shop fabricated and be loose, to be field attached.

2.3.3.1 End Splashes

End splashes shall be provided loose for installation at the job site after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Shelving

Shelving and wall support brackets shall be fabricated from 1/2 inch thick solid surfacing, solid polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings.

2.3.5 Window Stools

Fabricate window stools from 1/2 inch thick solid surfacing, solid polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings.

2.3.6 Counter and Vanity Tops

Fabricate all solid surfacing, solid polymer counter top and vanity top components from 1/2 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 4 inch high loose with coved transition backsplash and loose endsplashes where indicated on the drawings. Attach 2 inch wide reinforcing strip of polymer material under each horizontal countertop seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of countertop shown on the project drawings. The sample shall include the edge profile and backsplash as detailed on the project drawings. Solid polymer material shall be of a pattern and color as indicated on the drawings. Sample shall include at least one seam. Approved sample shall be retained as standard for this work.

2.3.6.1 Counter Top With Sink

a. Stainless Steel Sink. Countertops with sinks shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for stainless steel installation shall

be provided. Seam between sink and countertop shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

2.3.6.2 Vanity Tops With Bowls

a. Countertops with vitreous china bowls shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for vitreous china rimless installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between components using manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to countertops using solid polymer manufacturer's recommended clear silicone sealant and mounting hardware. Solid polymer sinks and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Loose splashes shall be adhered to the counter top with a color matched silicone sealant when the solid polymer components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid polymer splashes to counter tops.

3.1.2 Silicone Sealant

Use a clear, silicone sealant or caulk to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2 CLEAN-UP

Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will

provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

-- End of Section --

SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION
11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C665	(2012) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2012) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM E136	(2012) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2013) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Accessories

SD-08 Manufacturer's Instructions

Insulation

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.4 SAFETY PRECAUTIONS

1.4.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.4.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.2 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings with a flame spread rating of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.2.1 Recycled Materials

Provide Thermal Insulation containing recycled materials to the extent practicable, provided the material meets all other requirements of this section. The minimum required recycled materials content by weight are:

Fiberglass: 20 to 25 percent glass cullet.

2.2.2 Prohibited Materials

Do not provide asbestos-containing materials.

2.2.3 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

ULE Greenguard.

2.3 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around chimneys and heat producing devices.

2.4 ACCESSORIES

2.4.1 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.4.2 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking at Attic Vents and Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from slipping over, clogging, or restricting air flow through soffit vents at eaves. Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.

3.2.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

b. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Cold Climate Requirement

Place insulation to the outside of pipes.

3.3.1.4 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

3.3.1.5 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.3.1.6 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through soffit vents.

3.3.1.7 Access Panels and Doors

Affix blanket insulation to access panels greater than one square foot and access doors in insulated floors and ceilings. Use insulation with same R-Value as that for floor or ceiling.

-- End of Section --

SECTION 07 42 63

FABRICATED WALL PANEL ASSEMBLIES
05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1	(2005) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2015) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A463/A463M	(2010; R 2015) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A606/A606M	(2009a) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2015) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C273/C273M	(2011) Shear Properties of Sandwich Core Materials
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D1621	(2010) Compressive Properties of Rigid Cellular Plastics
ASTM D1622/D1622M	(2014) Apparent Density of Rigid Cellular Plastics
ASTM D1667	(2005; R 2011) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2244	(2015a) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2011) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached

	Organic Coatings
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D6226	(2010) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM D714	(2002; R 2009) Evaluating Degree of Blistering of Paints
ASTM D822	(2001; R 2006) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2015) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E136	(2012) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E1592	(2005; R 2012) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM	(2002) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

UNDERWRITERS LABORATORIES (UL)

UL 580	(2006; Reprint Oct 2013) Tests for Uplift Resistance of Roof Assemblies
UL Bld Mat Dir	(2012) Building Materials Directory

1.2 DEFINITIONS

Fabricated Wall Panel Assembly: Metal wall and liner panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories shop fabricated or field assembled for a complete weather-tight wall system.

1.3 DESCRIPTION OF FABRICATED WALL PANEL ASSEMBLY SYSTEM

Factory color finished, aluminum metal wall panel system with concealed fastening attachment. Panel profile must be smooth face as shown on drawings. Interior finish of panel assembly to be manufacturers standard.

1.3.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wall panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M

ASTM A653/A653M
ASTM A463/A463M for aluminum coated steel sheet.
ASTM A606/A606M

ASTM A780/A780M for repair of damage or uncoated areas of hot-dipped galvanized coating.

ASTM C273/C273M
ASTM D522/D522M for applied coatings.
UL Bld Mat Dir

1.3.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Contractor must provide design for members and connections not shown on the drawings. Siding panels and accessories must be the products of the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress

requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels.

Wall systems and attachments are to resist the wind loads as determined by UL 580 and ASCE 7 in the geographic area where the construction will take place, in pounds per square foot. Submit five copies of wind load tests and seismic tests to the Contracting Officer.

1.3.3 Air Infiltration

Air leakage must conform to the limits through the wall assembly area when tested according to ASTM E283.

1.3.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.3.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer
Qualification of Installer
Qualifications for Welding Work

SD-02 Shop Drawings

Fabrication and Installation drawings for the following items are to indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips.

Wall Panel Assemblies
Flashing and Accessories
Anchorage Systems

SD-03 Product Data

Submit Manufacturer's catalog data for the following items:

Factory Color Finish
Sub-girts and Formed Shapes
Closure Materials
Insulation
Pressure Sensitive Tape
Sealants and Caulking
Rated Wall Assembly
Galvanizing Repair Paint
Enamel Repair Paint

Accessories

SD-04 Samples

Submit as required each of the following samples:

Wall Panel Assemblies, 12 inches long by actual panel width
Fasteners
Metal Closure Strips, 10 inches long of each type
Insulation, approximately 8 by 11 inches

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

SD-05 Design Data

wind design analysis

SD-06 Test Reports

Submit test reports for the following in accordance with the referenced articles in this section.

Leakage Tests
wind load tests

Coatings and base metals of metal wall type of test as specified in paragraphs entitled, "Steel Sheet Materials," and in various referenced standards in this section.

Factory Color Finish Performance Requirements

SD-07 Certificates

Submit certificates for the following items showing conformance with referenced standards contained in this section:

Fasteners
Galvanizing Repair Paint
Enamel Repair Paint

Provide evidence that products used within this specification are manufactured in the United States.

Qualification of Manufacturer

Certify that the manufacturer of the metal wall panel system meets requirements specified under paragraph entitled "Qualification of Manufacturer."

Qualification of Installer

Certify that the applicator meets requirements specified under paragraph entitled "Qualification of Installation Contractor."

Submit the wall system assembly wind load and fire rating classification listings.

SD-08 Manufacturer's Instructions

Installation of Wall panels

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.

SD-11 Closeout Submittals

Warranty
Instructions To:
Government and/or Contractor Personnel
Include copies of Material Safety Data Sheets for maintenance/repair materials

Submit 20 year "No-Dollar-Limit" warranty for labor and materials.

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

After submittals are received and approved but before wall panel and insulation work, including associated work, is performed, the Contracting Officer will hold a pre-siding conference to review the following:

a. The drawings, including Fabrication and Installation drawings,showing complete Wall Panel Assemblies, and specifications. Include details for the following for review:

flashing and accessories
anchorage systems
manufacturer's catalog data
Factory Color Finish

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

Sub-girts and Formed Shapes
Closure Materials, including metal closure strips
Insulation
Pressure Sensitive Tape
Rated Wall Assembly test data
Accessories
Fasteners

b. Finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

c. Methods and procedures related to metal wall panel installation, including manufacturer's written instructions for Installation of Wall panels, and verification of wall system assembly wind load and fire rating classification listings.

d. Support conditions for compliance with requirements, including alignment between and attachment to structural members. Provide details of wind design analysis including wind speed, exposure category, co-efficient, importance factor, designates type of facility, negative pressures for each zone, methods and requirements of attachment. Wind design analysis to include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis to be prepared and sealed by Licensed Project Engineer in the geographic area where the construction will take place.

e. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

f. Governing regulations and requirements for insurance, certificates, tests and inspections if applicable. Include certification for sustainable acquisition and wall system assembly wind load and fire rating classification. Safety plan review must include applicable Material Safety Data Sheets.

g. Temporary protection requirements for metal wall panel assembly during and after installation.

h. Wall panel observation and repair procedures after metal wall panel installation. Include review of sample Galvanizing Repair Paint.

i. Sample 20 year "No-Dollar-Limit" warranty.

1.5.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.5.3 Qualification of Manufacturer

Metal wall panel system manufacturer must have:

a. A minimum of five (5) years experience in manufacturing metal wall system and accessory products.

b. Provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures for the MBMA MBSM; ASCE 7, and ASTM E1592.

c. Provide certified engineering calculations using the products submitted for:

(1) Wind load requirements in accordance with FM Wind Design Guide and ASCE 7.

1.5.4 Qualification of Installer

The installation contractor must be approved and certified by the wall panel manufacturer prior to beginning the installation of the metal wall system.

1.5.4.1 Qualifications for Welding Work

Welding procedures must conform to AWS A5.1/A5.1M, AWS D1.1/D1.1M for steel or AWS D1.2/D1.2M for aluminum.

1.5.5 Single Source

Obtain each type of metal wall, clips, closures and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.5.6 Surface-Burning Characteristics

Provide metal wall panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less.

1.5.7 Fire-Resistance Ratings

Where indicated, provide metal wall panels identical to those of assemblies tested for fire resistance per ASTM E119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
Combustion Characteristics: ASTM E136.

1.5.8 Fabrication

Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

1.5.8.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

1.5.9 Finishes

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1.6 DELIVERY, HANDLING, AND STORAGE

Deliver and package components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed and protected during transportation and handling.

Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

Protect foam-plastic insulation as follows:

a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

b. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS

Weather Limitations: Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing walling system or building.

Field Measurements: Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

Furnish manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than twenty (20) years from the date of Government acceptance of the work. The warranty is to be issued directly to the Government. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal wall panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

2.1.1 Foam-Insulation Core Wall Panel

Provide factory-formed aluminum wall panel assembly fabricated from two sheets of metal with modified polyisocyanurate or polyurethane foam insulation core foamed-in-place during fabrication with joints between panels designed to form weather-tight seals. Include accessories required for weather-tight installation.

a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.

b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D1622/D1622M.

c. Compressive Strength: Minimum 20 psi when tested according to ASTM D1621.

d. Shear Strength: 26 psi when tested according to ASTM C273/C273M.

2.1.2 Finish

All panels are to receive a factory-applied polyvinylidene fluoride finish consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.

b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. This prime coat must be oven cured prior to application of finish coat.

c. Exterior Finish Coating: Apply the finish coating over the primer by roll coating to dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). This finish coat must be oven-cured.

d. Interior Finish Coating: Apply a wash-coat on the reverse side over the primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. The wash-coat must be oven-cured.

e. Color: The exterior finish chosen from the manufacturer's standard color chart.

f. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

Chalking:	ASTM D4214
Color Change and Conformity:	ASTM D2244
Weatherometer:	ASTM G152, ASTM G153 and ASTM D822
Humidity:	ASTM D2247 and ASTM D714
Salt Spray:	ASTM B117
Chemical Pollution:	ASTM D1308
Gloss at 60:	ASTM D523
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Flexibility:	ASTM D522/D522M
Abrasion:	ASTM D968
Flame Spread:	ASTM E84

2.2 MISCELLANEOUS METAL FRAMING

2.2.1 General

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and specified in Division 05 Section 05 40 00 "Cold-Formed Metal Framing" unless otherwise indicated.

2.2.2 Fasteners for Miscellaneous Metal Framing

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties

required to fasten miscellaneous metal framing members to substrates in accordance with the wall panel manufacturer's and ASCE 7 requirements.

2.3 FASTENERS

2.3.1 General

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to substrates in accordance with the wall panel manufacturer's and ASCE 7 requirements.

2.3.2 Fasteners

Fasteners for wall panels to be corrosion resistant coated steel, aluminum, stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories to be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inches thick.

2.3.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.3.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

2.3.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M, or Series 305 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.4 ACCESSORIES

2.4.1 General

All accessories to be compatible with the metal wall panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips to be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.4.2 Rubber Closure Strips

Closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.4.3 Metal Closure Strips

Factory fabricated aluminum closure strips to be the same gauge, color, finish and profile of the specified wall panel.

2.4.4 Joint Sealants

2.4.4.1 Sealants and Caulking

Sealants are to be an approved gun type for use in hand- or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F) with minimum solid content of 85 percent of the total volume. Sealant is to dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.4.4.2 Shop-Applied

Sealant for shop-applied caulking must be an approved gun grade, non-sag one component polysulfide or silicone conforming to ASTM C920, Type II, and with a curing time to ensure the sealant's plasticity at the time of field erection.

2.4.4.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920, Type II. Color to match panel colors.

2.4.4.4 Tape Sealant

Pressure sensitive, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.5 SHEET METAL FLASHING AND TRIM

2.5.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.6 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish furnished by the wall panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

a. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

b. Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7 and as required for the geographical area where construction will take place.

c. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

d. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

e. Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

f. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

a. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

b. Miscellaneous Framing: Install sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide metal wall panels of full length from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement in accordance with MBMA Metal Building Systems Manual.

a. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for exterior surfaces and aluminum or galvanized steel fasteners for interior surfaces.

b. Anchor Clips: Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

c. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

d. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Bent, chipped, or defective sheets shall not be applied.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

Sheet metalwork is to be accomplished to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

Exposed metal flashing is to be installed at building corners, sills and eaves, junctions between metal siding and walling.

Exposed metal flashing is to be the same material, color, and finish as the specified metal wall panel.

Flashing is to be fastened at not more than 8 inches on center, except where flashing are held in place by the same screws that secure covering sheets.

Flashing is to be furnished in at least 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.

Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.

Flashing which is in contact with dissimilar metals to be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Drips to be formed to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Horizontal lines must not vary more than 1/8 inch in 40 feet.

3.7.2 Leakage Tests

Finished application of metal wall panels are to be subject to inspection and test for leakage by the Contractors testing agency. Inspection and tests will be conducted without cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be

uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government.

New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from government property and legally dispose of them.

-- End of Section --

SECTION 07 60 00

FLASHING AND SHEET METAL
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D41/D41M	(2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

1.2 GENERAL REQUIREMENTS

Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades. Coordinate

installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Gutters; G

Downspouts; G

Expansion joints; G

Gravel stops and fascias; G

Splash pans; G

Base flashing; G

Counterflashing; G

Flashing at roof penetrations; G

Reglets; G

Copings; G

Drip edge; G

Eave flashing; G

Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

SD-11 Closeout Submittals

Quality Control Plan

Submit for sheet metal work in accordance with paragraph entitled "Field Quality Control."

1.4 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. Use any metal listed by SMACNA Arch. Manual for a particular item, unless otherwise specified or indicated. Conform to the requirements specified and to the thicknesses and configurations established in SMACNA Arch. Manual for the materials. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items must be copper.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used except as follows:

2.1.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascias; cap, valley, steeped, base, and eave flashings and related accessories.

2.1.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.1.3 Stainless Steel

ASTM A167, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.1.4 Aluminum Alloy Sheet and Plate

ASTM B209 anodized to match adjacent surface form alloy, and temper appropriate for use.

2.1.4.1 Finish

Exposed exterior sheet metal items of aluminum must have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils and color to match roof panels and additional trim colors as scheduled on drawings.

2.1.5 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B221.

2.1.6 Solder

ASTM B32, 95-5 tin-antimony.

2.1.7 Polyvinyl Chloride Reglet

ASTM D1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness.

2.1.8 Bituminous Plastic Cement

ASTM D4586/D4586M, Type I.

2.1.9 Asphalt Primer

ASTM D41/D41M.

2.1.10 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials and where exposed.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Metal Roofing

Reference specification Section 07 41 13 for metal roof requirements.

3.1.2 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.3 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inch. Confine nailing of flashing to one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

3.1.4 Cleats

Provide cleats for sheet metal 18 inch and over in width. Space cleats evenly not over 12 inch on center unless otherwise specified or

indicated. Unless otherwise specified, provide cleats of 2 inch wide by 3 inch long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Where the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Pretin cleats for soldered seams.

3.1.5 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inch or less in thickness.

3.1.6 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.6.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

3.1.6.2 Lap Seams

Overlap seams not less than 3 inch.

3.1.6.3 Loose-Lock Expansion Seams

Not less than 3 inch wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.6.4 Flat Seams

Make seams in the direction of the flow.

3.1.7 Soldering

Where soldering is specified, apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items. Pretin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.7.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pretinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.8 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than 0.040 inch. Aluminum 0.040 inch or less in thickness must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled

with sealant as recommended by the aluminum manufacturer.

3.1.8.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.8.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inch maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inch from the end of the overlapping sheet.

3.1.9 Protection from Contact with Dissimilar Materials

3.1.9.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.9.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.9.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.9.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.10 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascias by expansion and contraction joints spaced not more than 12 feet apart.

3.1.11 Base Flashing

Extend up vertical surfaces of the flashing not less than 8 inch and not less than 4 inch under the roof covering. Where finish wall coverings

form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 6 inch. Overlap the flashing strips with the previously laid flashing not less than 3 inch. Fasten the strips at their upper edge to the deck. Horizontal flashing at vertical surfaces must extend vertically above the roof surface and fastened at their upper edge to the deck a minimum of 6 inch on center with large headed aluminum roofing nails or hex headed, galvanized shielded screws a minimum of 2-inch lap of any surface. Solder end laps and provide for expansion and contraction. Extend the metal flashing over crickets at the up-slope side of curbs and similar vertical surfaces extending through sloping roofs, the metal flashings. Extend the metal flashings onto the roof covering not less than 4.5 inch at the lower side of vertical surfaces extending through the roof decks. Install and fit the flashings so as to be completely weathertight. Provide factory-fabricated base flashing for interior and exterior corners. Do not use metal base flashing on built-up roofing.

3.1.12 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 9 to 10 inch above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inch. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum 8 inch by 10 inch or may be of the preformed one-piece type. Provide end laps in counterflashings not less than 3 inch and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form the flashings to the required shapes before installation. Factory-form the corners not less than 12 inch from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inch apart; on short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inch into the walls. Install counterflashing to provide a spring action against base flashing. Where bituminous base flashings are provided, extend down the counter flashing as close as practicable to the top of the cant strip. Factory form counter flashing to provide spring action against the base flashing.

3.1.13 Metal Reglets

Provide factory fabricated caulked type or friction type reglets with a minimum opening of 1/4 inch and a depth of 1 1/4 inch, as approved.

3.1.13.1 Caulked Reglets

Provide with rounded edges and metal strap brackets or other anchors for securing to the concrete forms. Provide reglets with a core to protect them from injury during the installation. Provide built-up mitered corner pieces for internal and external angles. Wedge the flashing in the reglets with lead wedges every 18 inch, caulked full and solid with an approved compound.

3.1.13.2 Friction Reglets

Provide with flashing receiving slots not less than 5/8 inch deep, one inch jointing tongues, and upper and lower anchoring flanges installed at 24 inch maximum snaplock receiver. Insert the flashing the full depth of

the slot and lock by indentations made with a dull-pointed tool, wedges, and filled with a sealant. For friction reglets, install flashing snaplock receivers at 24 inch on center maximum. When the flashing has been inserted the full depth, caulk the slot and lock with wedges and fill with sealant.

3.1.14 Gravel Stops and Fascias

Prefabricate in the shapes and sizes indicated and in lengths not less that 8 feet. Extend flange at least 4 inch onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascias after all plies of the roofing membrane have been applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascias on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in.Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 1.5 inch long spaced not more than 3 inch on center, in two staggered rows.

3.1.14.1 Edge Strip

Hook the lower edge of fascias at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inchmaximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inch on center driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.14.2 Joints

Leave open the section ends of gravel stops and fascias 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inch set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascias in accordance with the manufacturer's printed instructions and details.

3.1.15 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inch minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters by continuous cleats and or by cleats spaced not less than 36 inch apart. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from metals.

3.1.16 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the masonry or steel substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

3.1.16.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout. Provide downspouts terminating in splash blocks with elbow-type fittings. Provide splash pans as specified.

3.1.17 Splash Pans

Install splash pans where downspouts discharge on roof surfaces and at other locations as indicated. Unless otherwise shown, provide pans not less than 24 inch long by 18 inch wide with metal ribs across the bottom of the pan. Form the sides of the pan with vertical baffles not less than one inch high in the front, and 4 inch high in the back doubled over and formed continuous with horizontal roof flanges not less than 4 inch wide. Bend the rear flange of the pan to contour of cant strip and extend up 6 inch under the side wall covering or to height of base flashing under counterflashing. Bed the pans and roof flanges in plastic bituminous cement and strip-flash as specified.

3.1.18 Eave Flashing

One piece in width, applied in 8 to 10 foot lengths with expansion joints spaced as specified in paragraph entitled "Expansion and Contraction." Provide a 3/4 inch continuous fold in the upper edge of the sheet to engage cleats spaced not more than 10 inch on center. Locate the upper edge of flashing not less than 18 inch from the outside face of the building, measured along the roof slope. Fold lower edge of the flashing over and loose-lock into a continuous edge strip on the fascia. Where eave flashing intersects metal valley flashing, secure with one inch flat locked joints with cleats that are 10 inch on center.

3.1.19 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 16 by 18 inch. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.1.20 Expansion Joints

Provide expansion joints for roofs, walls, and floors as indicated. Provide expansion joints in continuous sheet metal at 32 foot intervals for aluminum, aluminum gravel stops and fascias which must have expansion joints at not more than 12 foot spacing. Provide evenly spaced joints. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing. Conform to the requirements of Table I.

3.1.20.1 Roof Expansion Joints

Consist of curb with wood nailing members on each side of joint, bituminous base flashing, metal counterflashing, and metal joint cover. Bituminous base flashing is specified in Roofing Section. Provide counterflashing as specified in paragraph "Counterflashing," except as follows: Provide counterflashing with vertical leg of suitable depth to enable forming into a horizontal continuous cleat. Secure the inner edge to the nailing member. Make the outer edge projection not less than one inch for flashing on one side of the expansion joint and be less than the width of the expansion joint plus one inch for flashing on the other side of the joint. Hook the expansion joint cover over the projecting outer edges of counterflashing. Provide roof joint with a joint cover of the width indicated. Hook and lock one edge of the joint cover over the shorter projecting flange of the continuous cleat, and the other edge hooked over and loose locked with the longer projecting flange. Joints are specified in Table II.

3.1.20.2 Floor and Wall Expansion Joints

Provide U-shape with extended flanges for expansion joints in concrete and masonry walls and in floor slabs.

3.1.21 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck. Goose-necks, rainhoods, and power roof ventilators are specified in Section 23 00 00.

3.1.22 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic cement and nail 3 inch on center. Bend the top of sleeve over and extend down into the vent pipe a minimum of 2 inch. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed metal housing. Set metal housing with a metal sleeve having a 4 inch roof flange in bituminous plastic cement and nailed 3 inch on center. Extend sleeve a minimum of8 inch above the roof deck and lapped a minimum of 3 inch by a metal hood secured to the vent pipe by a draw band. Seal the area of hood in contact with vent pipe with an approved sealant.

3.1.23 Stepped Flashing

Stepped flashing shall be installed where sloping roofs surfaced with shingles abut vertical surfaces. Separate pieces of base flashing shall be placed in alternate shingle courses.

3.2 PAINTING

Field-paint sheet metal for separation of dissimilar materials.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification that specified material is provided and installed.

c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	Zinc-Coated Steel, U.S. Std. Gage
Building Expansion Joints					
Cover	16	.032	.015	.015	24

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	Zinc-Coated Steel, U.S. Std. Gage
Waterstop-bellows or flanged, U-type.	16	-	.015	.015	-
Covering on minor flat, pitched or curved surfaces	20	.040	.018	.018	-
Downspouts and leaders	16	.051	.015	.015	24
Downspout clips and anchors	-	.040 clip .125 anchor	-	-	-
Downspout straps, 2-inch	48 (a)	.060	.050	-	-
Flashings:					
Base	20	.040	.018	.018	24
Cap (Counter-flashing)	16	.032	.015	.015	26
Eave	16	-	.015	.015	24
Spandrel beam	10	-	.010	.010	-
Stepped	16	.032	.015	.015	-
Valley	16	.032	.015	.015	-
Pipe vent sleave (d)					
Coping	16	-	-	-	-
Gravel stops and fascias:					
Extrusions	-	.075	-	-	-
Sheets, corrugated	16	.032	.015	.015	-

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	Zinc-Coated Steel, U.S. Std. Gage
Sheets, smooth	20	.050	.018	.018	24
Edge strip	24	.050	.025	-	-
Gutters:					
Gutter section	16	.032	.015	.015	24
Continuous cleat	16	.032	.015	.015	24
Hangers, dimensions	1 inch by 1/8 inch (a)	1 inch by .(inch (c)	1 inch by .0 inch	-	-
Joint Cover plates (See Table II)	16	.032	.015	.015	24
Reglets (c)	10	-	.010	.010	-
Splash pans	16	.040	.018	.018	-

(a) Brass.

(b) May be lead weighing 4 pounds per square foot.

(c) May be polyvinyl chloride.

(d) 2.5 pound minimum lead sleeve with 4 inch flange. Where lead sleeve is impractical, refer to paragraph entitled "Single Pipe Vents" for optional material.

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for building expansion seam, cleated joint at roof	1.25 inch single lock, standing seam, cleated	1.25 inch single lock, standing	--
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum producer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound compound.
Cap-in reglet	3 inch lap	3 inch lap	Seal groove with joint sealing compound.
Reglets	Butt joint	--	Seal reglet groove with joint sealing compound.
Eave	One inch flat locked, cleated. One inch loose locked, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
Sheet, corrugated	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing beneath and a cover plate or a combination unit
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

-- End of Section --

SECTION 07 84 00

FIRESTOPPING
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; E 2013;R 2013) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2007; R 2011) Fire-Resistive Joint Systems
ASTM E2174	(2014) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2010) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
ASTM E699	(2009) Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
ASTM E814	(2013a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	(2014) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2003; Reprint Oct 2012) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2012) Tests for Fire Resistance of Building Joint Systems
UL 723	(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2012) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

c. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2.2 Sequencing

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.2.3 Submittals Requirements

a. Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory,

installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

b. Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification of compliance with UL 1479.

c. Submit documentation of training and experience for Installer.

d. Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Inspection

SD-07 Certificates

Inspector Qualifications
Firestopping Materials
Installer Qualifications

1.4 QUALITY ASSURANCE

1.4.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or

b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer written certification of training,

and retain proof of certification for duration of firestop installation.

1.4.2 Inspector Qualifications

The inspector shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of two years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment. Firestop material must be free from Ethylene Glycol, PCB, MEK, or other types of hazardous chemicals.

2.1.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.1.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

2.1.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

F Rating = 1 hour, T Rating = 1 hour. Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating shall be in accordance with the requirements of ICC IBC.

2.1.3.1.3 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = 1 hour, T Rating = 1 hour and L Rating = <10 cfm/sf Where L rating is required.

2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SYSTEM DESCRIPTION, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier

to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products and devices as indicated.

3.2.3.1 Re-Enterable Devices

Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf measured at ambient temperature and 400 degrees F at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of

maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

3.3 INSPECTION

3.3.1 General Requirements

For Navy projects, install one of each type of penetration and have it inspected and accepted by the IPT South Atlantic Division, Naval Facilities Engineering Command, Fire Protection Engineer prior to the installation of the remainder of the penetrations. At this inspection, the manufacturer's technical representative of the firestopping material shall be present. For all projects, the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Contracting Officer. The inspector shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

3.3.2 Inspection Standards

Inspect all firestopping in accordance to ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS
01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C1311	(2014) Standard Specification for Solvent Release Agents
ASTM C509	(2006; R 2011) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C734	(2006; R 2012) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C919	(2012) Use of Sealants in Acoustical Applications
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1667	(2005; R 2011) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D217	(2010) Cone Penetration of Lubricating Grease
ASTM D2452	(2003; R 2009) Standard Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds
ASTM D2453	(2003; R 2009) Standard Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds
ASTM E84	(2014) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

SD-07 Certificates

Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

1.5 QUALITY ASSURANCE

1.5.1 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

1.5.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.5.3 Mock-Up

Project personnel is responsible for installing sealants in mock-up prepared by other trades, using materials and techniques approved for use on the project.

1.6 SPECIAL WARRANTY

Guarantee sealant joint against failure of sealant and against water

penetration through each sealed joint for five years.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

2.1.1 Interior Sealant

Provide ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) and color(s) of sealant for the following:

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.	As selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected

2.1.2 Exterior Sealant

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color
b. Joints between new and existing exterior masonry walls.	Match adjacent surface color
c. Masonry joints where shelf angles occur.	Match adjacent surface color
d. Joints in wash surfaces of stonework.	Match adjacent surface color
e. Expansion and control joints.	Match adjacent surface color
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Match adjacent surface color
g. Voids where items pass through exterior walls.	Match adjacent surface color
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent surface color
i. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface color
j. Joints between ends of gravel stops, fascias, copings, and adjacent walls.	Match adjacent surface color

2.1.3 Floor Joint Sealant

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	As selected

LOCATION	COLOR
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	As selected

2.1.4 Acoustical Sealant

Rubber or polymer-based acoustical sealant conforming to ASTM C919 must have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant must have a consistency of 250 to 310 when tested in accordance with ASTM D217, and must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734, and must be non-staining.

2.1.5 Preformed Sealant

2.1.5.1 Foam Strip

Provide foam strip of polyurethane foam. Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed as recommended by the manufacturer. Service temperature must be minus 40 to plus 275 degrees F. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed into adjacent finishes. Saturate treated strips with butylene waterproofing or impregnated with asphalt.

2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Make backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.4.1 Rubber

Conform to ASTM D1056, Type 1, open cell, or Type 2, closed cell, Class A, round cross section for cellular rubber sponge backing.

2.4.2 PVC

Conform to ASTM D1667, Grade VO 12, open-cell foam, round cross section for Polyvinyl chloride (PVC) backing.

2.4.3 Synthetic Rubber

Conform to ASTM C509, Option I, Type I preformed rods or tubes for Synthetic rubber backing.

2.4.4 Neoprene

Conform to ASTM D1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 open cell neoprene sponge Type 1, Class C, Grade 1C3 for Neoprene backing.

2.4.5 Butyl Rubber Based

Provide Butyl Rubber Based Sealants of single component, solvent release, color as selected, conforming to ASTM C1311.

2.4.6 Silicon Rubber Base

Provide Silicon Rubber Based Sealants of single component, solvent release, color as selected, conforming to ASTM C920, Non-sag, Class 25.

2.5 CAULKING

Conform to ASTM D2452 and ASTM D2453.

2.6 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, contact sealant manufacturer for specific recommendations.

3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove

laitance, efflorescence and loose mortar from the joint cavity.

3.1.4 Wood Surfaces

Keep wood surfaces to be in contact with sealants free of splinters and sawdust or other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

3.3 APPLICATION

3.3.1 Joint Width-To-Depth Ratios

a. Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 2 inch	1/2 inch	5/8 inch
Over 2 inch	As recommended by sealant manufacturer	

b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is not required on metal surfaces.

3.3.2 Masking Tape

Place masking tape on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Remove masking tape within 10 minutes after joint has been filled and tooled.

3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

a. Where indicated.

b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios".

3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Make sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Apply sealer over the sealant when and as specified by the sealant manufacturer.

3.4 PROTECTION AND CLEANING

3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C578	(2014a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2013) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014) Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2013) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E1300	(2012a; E 2012) Determining Load Resistance of Glass in Buildings
ASTM F2247	(2011) Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design

	Loading for Blast Resistant Glazing Fabricated with Laminated Glass
ASTM F2927	(2011) Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2006) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA HMM	(1999; R2000) Hollow Metal Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2013) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2012) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories
SDI/DOOR 113	(2001; R2006) Standard Practice for Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.11	(2001) Recommended Erection Instructions for Steel Frames
SDI/DOOR A250.6	(2003; R2009) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2009) Standard for Positive Pressure Fire Tests of Door Assemblies

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Frames; G

Accessories

Weatherstripping

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of doors; G

Schedule of frames; G

Submit door and frame locations.

SD-03 Product Data

Doors; G

Frames; G

Accessories

Weatherstripping

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI/DOOR A250.8 requirements.

SD-04 Samples

Factory-applied enamel finish; G

Where colors are not indicated, submit manufacturer's standard colors and patterns for selection.

SD-06 Test Reports

Glazed door airblast test; G

Unglazed door static test; G

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

1.4 PERFORMANCE REQUIREMENTS

1.4.1 Blast Resistance

Exterior doors opening into inhabited areas shall provide a Low level of protection in accordance with UFC 4-010-01 for a blast loading with peak pressure of 9 psi and positive phase impulse of 40 psi-msec. Fasteners and anchorage methods used to attach the tested door assembly shall be representative of the actual door installation. Any deviations in actual installation of connections or connected elements from those tested shall be demonstrated by calculation to provide the required level of protection for the specific application.

1.4.1.1 Glazed Doors

Provide glazed doors that have been tested in accordance with ASTM F2927 and received a door damage rating of Category III or better and a glazing hazard rating of Very Low or better.

1.4.1.2 Unglazed Doors

Provide unglazed doors that have been tested in accordance with ASTM F2247 or ASTM F2927 and received a door damage rating of Category III or better.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1-3/4 inch thick, unless otherwise indicated. Provide exterior glazing in accordance with ASTM F2248 and ASTM E1300.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Heavy Duty Doors

SDI/DOOR A250.8, Level 2, physical performance Level B, Model 2, with core construction as required by the manufacturer for interior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation. Provide Level 2 for all interior steel doors, except where higher level doors are required as indicated in the following paragraphs.

Interior doors to be steel stiffened with mineral wool insulation, 16 gage steel, of seamless design, A60 galvanized.

2.1.1.2 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 2 and 3 with core construction as required by the manufacturer for interior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation. Provide Level 3 for all interior corridor and egress doors.

Exterior doors to be blast resistant as indicated, minimum 14 gage steel, of seamless design, A60 galvanized.

2.2 CUSTOM HOLLOW METAL DOORS

Provide custom hollow metal doors where nonstandard steel doors are indicated. At the Contractor's option, custom hollow metal doors may be provided in lieu of standard steel doors. Door size(s), design(s), materials, construction, gages, and finish shall be as specified for standard steel doors and shall comply with the requirement of NAAMM HMMA HMM. Fill all spaces in doors with insulation. Close top and bottom edges with steel channels not lighter than 16 gage. Prepare doors to receive hardware specified in Section 08 71 00 DOOR HARDWARE. Undercut doors where indicated. Doors shall be 1-3/4 inch thick, unless otherwise indicated.

Provide STC rated, Blast and Insulated hollow metal custom steel doors as indicated in the door schedule.

2.3 SOUND RATED STEEL DOORS

Doors shall have a Sound Transmission Class (STC) as indicated on the drawings.

2.4 ACCESSORIES

2.4.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

2.4.2 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.5 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and shall conform to:

a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or

b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or

c. Mineral board: ASTM C612, Type I.

2.6 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 2, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, transoms, sidelights, mullions, and cased openings, as indicated on Drawings.

2.6.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

Interior frames to be 14 gage, A60 gal, fully welded of profile and jamb depth per drawings. Exterior frames to be minimum 12 gage, A60 gal, fully welded kerf frames if jamb depth per drawings.

2.6.2 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and be a member with heads and jambs butt-welded thereto. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

2.6.3 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.6.4 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.6.5 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.6.5.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for

each additional 2.5 feet or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;

b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;

c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111; and

2.6.5.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.7 FIRE AND SMOKE DOORS AND FRAMES

NFPA 80 and NFPA 105 and this specification. The requirements of NFPA 80 and NFPA 105 shall take precedence over details indicated or specified.

2.7.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10C. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

2.7.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.7.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements. On smoke control doors, conform to NFPA 105.

2.8 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

2.9 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in SDI/DOOR A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware

into the door at the factory. Locate hardware in accordance with the requirements of SDI/DOOR A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.10 FINISHES

2.10.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI/DOOR A250.8. Where coating is removed by welding, apply touchup of factory primer.

2.10.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924Mand ASTM A653/A653M. The coating weight shall meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in SDI/DOOR A250.8. Provide for exterior doors.

2.10.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A879/A879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.11 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.11.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

2.12 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00 GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80 and NFPA 105.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 14 00

WOOD DOORS
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI AWS	(2009) Architectural Woodwork Standards

ASTM INTERNATIONAL (ASTM)

ASTM E2226	(2012) Standard Practice for Application of Hose Stream
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2013) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2012) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint Apr 2009) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors
WDMA I.S.4	(2013) Preservative Treatment for Millwork
WDMA TM-7	(2008) Cycle Slam Test Method
WDMA TM-8	(2008) Hinge Loading Test Method

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Doors; G

Submit drawings or catalog data showing each type of door unit. Drawings and data shall indicate door type and construction, sizes, thickness, and glazing.

SD-03 Product Data

Doors; G

Accessories

Water-resistant sealer

Sample warranty

Sound transmission class rating; G

Fire resistance rating; G

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

Door finish colors; G

Submit a minimum of three color selection samples, minimum 3 by 5 inches in size representing wood stain for selection by the Contracting Officer.

SD-06 Test Reports

Cycle-slam

Hinge loading resistance

Submit cycle-slam test report for doors tested in accordance with WDMA TM-7, and hinge loading resistance test report for doors tested in accordance with WDMA TM-8.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under

construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.4 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated free of urea-formaldehyde resins.

2.1.1 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Provide hollow core doors with lock blocks and 1 inch minimum thickness hinge stile. Hardwood stile edge bands of doors receives a natural finish, compatible with face veneer. Provide mill option for stile edge of doors scheduled to be painted. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

2.1.1.1 Interior Flush Doors

Provide agrifiber solid core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of premium grade white oak. Hardwood veneers shall be rift cut slip matched.

2.1.2 Acoustical Doors

ANSI/WDMA I.S.1A, solid core, constructed to provide Sound Transmission Class rating of 30, 50 or 60, as indicated, when tested in accordance with ASTM E90.

2.1.3 Fire Doors

Provide doors specified or indicated to have a fire resistance rating conforming to the requirements of UL 10B, ASTM E2226, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers.

2.2.2 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Marking

Stamp each door with a brand, stamp, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based and identify doors having a Type I glue bond.

2.3.3 Preservative Treatment

Treat doors scheduled for restrooms, janitor closets and other possible wet locations including exterior doors with a water-repellent preservative treatment and so marketed at the manufacturer's plant in accordance with WDMA I.S.4.

2.3.4 Adhesives and Bonds

ANSI/WDMA I.S.1A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.5 Prefitting

Provide factory prefinished and factory prefitted doors for the specified hardware, door frame and door-swing indicated. Machine and size doors at the factory by the door manufacturer in accordance with the standards under which the doors are produced and manufactured. The work includes sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules to coordinate the work.

2.3.6 Finishes

2.3.6.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: AWI AWS Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is AWI AWS premium, medium rubbed sheen, open grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.6.2 Color

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

2.3.7 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the

specified finish.

2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges:

a. Cycle-slam: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of WDMA TM-7.

b. Hinge loading resistance: Averages of ten test samples not less than 700 pounds load when tested for direct screw withdrawal in accordance with WDMA TM-8 using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp shall not exceed1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

3.1.1 Fire and Smoke Doors

Install fire doors in accordance with NFPA 80. Install smoke doors in accordance with NFPA 105. Do not paint over labels.

-- End of Section --

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 501	(2005) Methods of Test for Exterior Walls
AAMA 503	(2008) Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems
AAMA 800	(2010) Voluntary Specifications and Test Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM E1105	(2000; R 2008) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
ASTM E1300	(2012a; E 2012) Determining Load

	Resistance of Glass in Buildings
ASTM E1424	(1991; R 2008) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
ASTM E1886	(2013a) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330	(2002; R 2010) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E783	(2002; R 2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM F1642	(2012) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass
ASTM F2912	(2011) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2927	(2012) Standard Test Method for Door Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.10	(2011) Power Operated Pedestrian Doors
ANSI/BHMA A156.4	(2013) Door Controls - Closers

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual

U.S. ARMY CORPS OF ENGINEERS (USACE)

PDC-TR 10-02	(2010) Blast Resistant Design Methodology for Window Systems Designed Statically and Dynamically

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

UNDERWRITERS LABORATORIES (UL)

UL 325	(2013) Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

Within 30 days of the Contract Award, submit the following for review and approval by the Contracting Officer:

Listing of product installations

Sample warranty

Finish and color samples

Manufacturer's catalog data

Installation drawings

Fabrication drawings for custom fabrications

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

a. Air Infiltration ASTM E783

b. Wind Load (Resistance) AAMA 501

c. Deflection ASTM F1642

d. Condensation Resistance and Thermal Transmittance Performance Requirements

e. Water Infiltration ASTM E1105

f. Structural Requirements ASTM F1642

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty; G

Listing of Product Installations; G

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Manufacturer's Catalog Data; G

SD-04 Samples

Finish and Color Samples; G

SD-05 Design Data

Blast Effects Design Analysis; G

SD-06 Test Reports

Certified Test Reports; G

Airblast Test Reports; G

Static Test Reports; G

SD-07 Certificates

Manufacturer's Product Warranty; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Installer Qualifications

Provide documentation of Installer experience to perform work of this section, who has specialized in the installation of work similar to that required for this project, and who is acceptable to product manufacturer.

1.4.1.2 Manufacturer Qualifications

Manufacturers are acceptable providing they meet the requirements specified in this section and project drawings.

Ensure manufacturer is capable of providing field service representation

during construction, approving acceptable installer and approving application method.

1.4.2 Single Source Responsibility

When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

Provide design, structural engineering, and custom fabrication for door portal system and supply of all components, materials, and products based on a single manufacturer of sole responsibility. Provision of products from numerous sources for site assembly without complete single source design and supply responsibility is not acceptable. Work items and components to be fabricated or supplied by single source are:

a. Door assemblies to be installed in door portal.

b. Glazed wall to be constructed around door portal as specified in this Section.

c. Door operating hardware to be installed on or within door portal as specified in Section 08 71 00 DOOR HARDWARE.

d. Glass as specified in Section 08 81 00 GLAZING.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Ordering

Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

1.5.2 Packing, Shipping, Handling and Unloading

Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.5.3 Storage and Protection

Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Field Measurements

Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

This Specification includes thermally broken aluminum entrances and storefronts.

Type of Aluminum Entrance includes:

Impact (blast and hurricane) Resistance Entrances; medium stile, 2-3/4 inch vertical face dimension, 5 inch depth, interior structural silicone glazed, high traffic/impact resistant applications.

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Design, size components, and install door portal system to withstand these loads without breakage, loss, failure of seals, product deterioration, and other defects, AAMA 503.

a. Dead and Live Loads: Determined by ASCE 7 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install system to comply with applicable seismic requirements for project location as defined by Section 1613 of the International Building Code (IBC).

c. Effects of applicable wind load acting inward and outward normal to plane of wall in accordance with ASTM E330.

d. Thermal Loads And Movement:

1. Ambient Temperature Range: 120 degrees F.

2. Material Surfaces Range: 180 degrees F.

e. Provide and install weatherstripping, exterior gaskets, sealants, and other accessories to resist water and air penetration.

f. Impact Protective Systems ASCE 7-10, Sections 26.10.3.1 and 2; ASTM E1886; and ASTM F1642.

2.1.1.1 Material Standard

ASTM B221 ASTM B221M; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows unless indicated otherwise:

Vertical Stile	Top Rail	Bottom Rail
5 inches	5 inches	8 inches

2.1.1.2 Tolerances

Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

Provide either EPDM elastomeric extrusions or thermoplastic elastomer

glazing gaskets. Structural silicone sealant is required.

2.1.2 Performance Requirements

2.1.2.1 Air Infiltration

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. For single acting offset pivot, butt hung or continuous geared hinge entrances in the closed and locked position, test the specimen in accordance with ANSI/BHMA A156.10, and ASTM E283 at a pressure differential of 1.57 psf for pairs of doors; maximum infiltration for a pair of 7 foot - 0 inch by 8 foot - 0 inch entrance doors and frame is 1.2 cfm/ft2.

b. Maximum allowable infiltration, for a completed storefront system is not to exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at differential static pressure of 6.24 psf.

2.1.2.2 Wind Loads

Provide completed storefront system capable of withstanding wind pressure loads, normal to the wall plane indicated, as follows:

a. Exterior Walls

1. Positive Pressure: 45 psf

2. Negative Pressure: 45 psf

b. Interior Walls: (pressure acting in either direction) 5 psf (interior vestibule walls to be designed to same loading as exterior).

c. In addition to wind loads, storefront system must also meet blast resistant requirements.

2.1.2.3 Deflection

Submit certified test reports showing compliance with specified performance characteristics as follows:

The maximum allowable deflection in any member when tested in accordance with ASTM E330 with allowable stress in accordance with AA Specifications for Aluminum Structures is L/175 or 3/4 inches maximum.

2.1.2.4 Condensation Resistance and Thermal Transmittance

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. U-Value Requirements:

1. Perform test in accordance with AAMA 1503 procedure and on the configuration specified therein.

2. Thermal Transmittance ("U" Value) maximum 0.375 (6250) BTU/hr/sf/deg F at 15 mph exterior wind.

b. CRF Class Requirements:

1. Perform test in accordance with AAMA 1503.

2. Condensation Resistance Factor Requirements (CRF) minimum 35.

2.1.2.5 Water Infiltration

Submit certified test reports showing compliance with specified performance characteristics as follows:

System is designed to provide no uncontrolled water when tested in accordance with ASTM E331 at a static pressure of 8 psf.

2.1.3 Blast Resistance Requirements for Glazing Systems

In accordance with UFC 4-010-01, exterior glazing systems shall provide a Low level of protection for a blast loading with peak pressure of 9 psi and positive phase impulse of 40 psi-msec. Comply with one or more of the following alternatives to satisfy this requirement.

2.1.3.1 Dynamic Analysis

Provide glazing systems that have been designed using dynamic analysis in accordance with USACE PDC-TR 10-02 to achieve performance equivalent to or better than the Very Low hazard rating as defined by ASTM F2912.

2.1.3.2 Airblast Testing

a. Testing shall be performed on the entire proposed glazing system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the tested assembly shall replicate the method of installation to be used for the project.

b. For glazing systems that are of the same type as the tested system but of different size, the test results may be accepted if the proposed assembly is within the range from 25 percent smaller to 10 percent larger in area than the tested assembly. Proposed assemblies of a size outside this range shall require new testing to evaluate their hazard rating.

c. Results for glazing systems previously tested in accordance with protocols other than ASTM F1642 may be accepted if the required loading, hazard rating, and size limitations stated herein are satisfied.

2.1.3.3 Static Design

Provide glazing systems with framing members, connections to surrounding walls or roofs, hardware and associated connections, glazing stop connections, and other elements in shear capable of withstanding a uniform static pressure applied to all glazing surfaces equal to two times the glazing resistance determined in accordance with ASTM E1300.

a. Glazing resistance shall be equal to or greater than the equivalent 3-second duration design loading determined in accordance with ASTM F2248.

b. Glazing shall be adhered to its supporting frame by applying one of the following to both sides of the glass for single pane glazing or to the inboard side only for insulating glass units.

(1) Structural silicone sealant with a bead width that is not less than 3/8-inch and at least equal to, but not larger than two times, the nominal thickness of the laminated glass pane. Minimum thickness of the bead shall be 3.16-inch.

(2) Glazing tape with a width that is at least equal to two times, but not larger than four times, the nominal thickness of the laminated glass pane.

c. For primary mullions in entrances and storefronts, deflection shall be limited to 1/60 of the span length between points of structural support.

d. For intermediate mullions in entrances and storefronts and punched or ribbon window frames, deflection shall be limited to 1/60 of the supported edge length, taken as equal to the longest span of a single glass panel, and calculated based on simple support conditions for that length.

e. Design of connections shall account for the geometry of the particular frame and connection configuration being used when calculating bending, shear, bearing, and pull-out loads.

2.1.4 Blast Resistance Requirements for Doors

In accordance with UFC 4-010-01, exterior glazed doors shall provide a Low level of protection for a blast loading with peak pressure of 9 psi and positive phase impulse of 40 psi-msec.

2.1.4.1 Airblast Testing

Provide doors that have been tested in accordance with ASTM F2927 and received a door damage rating of Category III or better and a glazing hazard rating of Very Low or better. Fasteners and anchorage methods used to attach the tested door assembly shall be representative of the actual door installation.

Any deviations in actual installation of connections or connected elements from those tested shall be demonstrated by calculation to provide the required level of protection for the specific application.

2.1.4.2 Mullions Between Pairs of Doors

If pairs of doors or deemed required to receive a center mullion to achieve blast resistance indicated, provide removable mullions and coordinated all associated hardware requirements.

2.2 FABRICATION

2.2.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Provide hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord.

Provide interior glazing stop mechanically fastened to the door member incorporating a silicone compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments to conceal from view.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

2.2.3 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

Fabricate aluminum entrances in accordance with entrance manufacturer's prescribed tolerances.

2.2.3.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.3.2 Joints

(Between adjacent members in same assembly: Hairline and square to adjacent member.

2.2.3.3 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.2.3.4 Flatness

For doors and fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.3 ACCESSORIES

2.3.1 Fasteners

Provide stainless steel where exposed.

2.3.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.3.3 Standard Entrance Hardware

Provide as indicated below unless noted otherwise in Hardware specification.

2.3.3.1 Weatherstripping

Equip meeting stiles on pairs of doors with an adjustable astragal utilizing wool pile with polymeric fin.

Provide door weatherstripping on a single acting offset pivot or butt hung door and frame (single or pairs) comprised of a thermoplastic elastomer weatherstripping on a tubular shape with a semi-rigid polymeric backing.

Provide Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Provide as necessary to meet specified performance tests.)

2.3.3.2 Threshold

Provide extruded aluminum threshold, one piece per door opening, with ribbed surface.

2.3.3.3 Offset Pivots

Provide manufacturer's standard top and bottom pivots with one intermediate offset pivot.

2.3.3.4 Panic Device

Provide manufacturer's recommended standard panic hardware.

2.3.3.5 Closer

Provide surface closer only per ANSI/BHMA A156.4.

2.3.3.6 Security Lock/Dead Lock

Provide A/R MS 1850A lock with (2) A/R 1871 cylinder operated flush bolts.

2.3.3.7 Cylinder(s)/Thumb-turn

Provide manufacturer's recommended standard.

2.3.3.8 Cylinder Guard

Manufacturer standard.

2.4 RELATED MATERIALS

2.4.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure all sealants conform to AAMA 800.

2.4.2 Glass

Refer to Section 08 81 00 GLAZING.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer's acceptable tolerances.

3.2 INSTALLATION

Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in bed of mastic and secure. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylatron pads or bituminous coating. Shim and brace aluminum system before anchoring to structure. Verify weep holes are open, and metal joints are sealed in accordance with manufacturer's installation instructions. Seal metal to metal joints using sealant recommended by system manufacturer.

3.2.1 Preparation

Field verify dimensions prior to fabricating door portal assembly components.

Coordinate requirements for locations of blockouts for anchorage of door portal columns and other embedded components with Section 03 30 00 CAST-IN-PLACE CONCRETE.

Coordinate erection of door portal with installation of surrounding glass wall and door assemblies. Ensure adequate provision is made for support and anchorage of assembly components.

Coordinate electrical requirements for electrified door hardware to ensure proper power source, conduit, wiring, and boxes.

3.2.1.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.1.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.2.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the manufacturer.

3.2.3 Related Products Installation Requirements

3.2.3.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

3.2.3.3 Reference

ANSI Z97.1, 16 CFR 1201 and GANA Glazing Manual.

3.3 PROTECTION AND CLEANING

3.3.1 Protection

Protect installed product's finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.3.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.4 WARRANTY

Submit three signed copies of manufacturer's product warranty for entrance system as follows:

Warranty Period: Five years from Date of Substantial Completion of the project, provided that the Limited Warranty begins in no event later than six months from date of shipment by manufacturer. In addition, support welded door corner construction with a limited lifetime warranty for the life of the door under normal use.

Ensure Warranty language is identical to "As Approved" version of the sample warranty submitted and returned from the Contracting Officer.

-- End of Section --

SECTION 08 44 00

CURTAIN WALL AND GLAZED ASSEMBLIES (AND WINDOW UNITS)
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA ADM	(2010) Aluminum Design Manual
AA ASD1	(2013) Aluminum Standards and Data
AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1	(2005) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
AAMA 501.4 & 501.6	(2009) Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts & Recommended Dynamic Test Method for Determining the Seismic Drift Causing Glass Fallout from a Wall System
AAMA 609 & 610	(2009) Cleaning and Maintenance Guide for Architecturally Finished Aluminum
AAMA 611	(1998; R 2004) Voluntary Specification for Anodized Architectural Aluminum
AAMA 800	(2010) Voluntary Specifications and Test Methods for Sealants
AAMA CW-10	(2004) Care and Handling of Architectural Aluminum from Shop to Site
AAMA MCWM-1	(1989) Metal Curtain Wall Manual
AAMA/WDMA/CSA 101/I.S.2/A440	(2011) Standard/Specification for Windows, Doors, and Skylights

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISC/AISI 121	(2004) Standard Definitions for Use in the Design of Steel Structures

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.10/A5.10M	(2012) Welding Consumables - Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys - Classification
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2013) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A1011/A1011M	(2014) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A36/A36M	(2012) Standard Specification for Carbon Structural Steel
ASTM A424/A424M	(2009a) Standard Specification for Steel Sheet for Porcelain Enameling
ASTM A501/A501M	(2014) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B108/B108M	(2014) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B136	(1984; R 2013) Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum
ASTM B137	(1995; R 2014) Standard Test Method for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B211	(2012) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B244	(2009; R 2014) Standard Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments
ASTM B26/B26M	(2014) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B316/B316M	(2010) Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
ASTM B85/B85M	(2014) Standard Specification for Aluminum-Alloy Die Castings
ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM C1363	(2011) Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
ASTM C542	(2005; R 2011) Lock-Strip Gaskets
ASTM C864	(2005; R 2011) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM D1730	(2009; R 2014) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM E1300	(2012a; E 2012) Determining Load Resistance of Glass in Buildings
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330/E330M	(2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E34	(2011) Chemical Analysis of Aluminum and Aluminum-Base Alloys
ASTM E546	(2008) Frost Point of Sealed Insulating Glass Units
ASTM E576	(2008) Frost Point of Sealed Insulating Glass Units in the Vertical Position
ASTM E84	(2014) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM F1642	(2012) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass
ASTM F2912	(2011) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

PORCELAIN ENAMEL INSTITUTE (PEI)

PEI 1001	(1996) Specification for Architectural Porcelain Enamel (ALS-100)

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC SP 1	(1982; E 2004) Solvent Cleaning
SSPC SP 3	(1982; E 2004) Power Tool Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

PDC-TR 10-02	(2010) Blast Resistant Design Methodology for Window Systems Designed Statically and Dynamically

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Glazed curtain wall system

Submit for curtain wall system, accessories, and mock-up. Tentative approval of drawings shall be received before fabrication of mock-up. Final approval of drawings will be deferred pending approval of mock-up and accessories. Drawings shall indicate in detail all system parts including elevations, full-size sections, framing, jointing, panels, types and thickness of metal, flashing and coping details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details, firestopping insulation materials, and erection details.

Installation Drawings
Shop-Painting Aluminum
Shop-Painting Steel

SD-03 Product Data

Glazed curtain wall system

Include descriptive literature, detailed specifications, and available performance test data.

Preventive Maintenance and Inspection
Metals For Fabrication
Nonskinning Sealing Compound
Metal Accessories
Curtain-wall Framing Members
Aluminum Doors and Frames
Curtain Wall Frame
Panels
Thermal Insulation Materials
Sealants and Caulkings
Curtain-Wall Installation Materials
Masonry Anchorage Devices
Sample warranties

SD-05 Design Data

Calculations
Finish
Exposed-to-View Aluminum Finish
Porcelain-Enamel
Seismic Calculations
Blast Effects Design Analysis; G

SD-06 Test Reports

Airblast Test Reports; G
Static Test Reports; G

SD-08 Manufacturer's Instructions

Glazed curtain wall system
Insulating glass

SD-11 Closeout Submittals

WARRANTY

1.3 REQUIREMENT FOR DESIGN DATA

Submit structural and thermal calculations for complete wall assembly.

1.4 QUALITY ASSURANCE

1.4.1 Testing Requirements

The components listed below shall be tested in accordance with the requirements below, and meet performance requirements specified.

a. Joint and Glazing Sealants: Perform tests as required by applicable publications referenced.

b. Preformed Compression Gaskets and Seals: ASTM C864.

c. Preformed Lock-strip Gaskets: ASTM C542, modified as follows: Heat age specimens seven days at 158 degrees F, in zipped or locked position under full design compression. Unzip, cool for one hour, re-zip, and test lip seal pressure, which must be minimum 2.5 pounds per linear inch on any extruded or corner specimen.

d. Spandrel Glass: Fallout resistance test, ASTM C1048.

e. Porcelain Enamel: Acid resistance, color retention, and spall resistance tests, PEI 1001.

f. Anodized Finishes: Stain resistance, coating weight, and coating thickness tests, ASTM B136, ASTM B137, and ASTM B244, respectively.

g. Insulating Glass: ASTM E546 or ASTM E576 at minus 20 degrees F, no frost or dew point.

1.4.2 Mockup

1.4.2.1 Construction

Construct at job site full size typical wall unit which incorporates horizontal and vertical joints, framing, window units, panels, glazing, and other accessories as detailed and specified. Mock-up wall unit size and design shall be as indicated.

1.4.2.2 Performance Test

Conduct after approval of visual aspects has been obtained. Finished work shall match approved mock-up.

1.4.2.3 Approved Mock-Up

After completion and approval of test results install, where directed, for reference during construction.

1.4.3 Factory Tests

Perform the following tests except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested, under the conditions specified herein, the resulting test reports may be submitted in lieu of testing the components listed below:

1.4.3.1 Deflection and Structural Tests

No curtain wall framing member shall deflect, in a direction normal to the plane of the wall, more than 1/175 of its clear span or 3/4 inch, whichever is less, when tested in accordance with ASTM E330/E330M, except that when a plastered surface will be affected the deflection shall not exceed 1/360 of the span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance with ASTM E330/E330M for a minimum test period of 10 seconds at 1.5 times the design wind pressures specified.

1.4.3.2 Water Penetration Test

No water penetration shall occur when the wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of the inward acting design wind pressure as specified, but not less than 4 psf. Make provision in the wall construction for adequate drainage to the outside of water leakage or condensation that occurs within the outer face of the wall. Leave drainage and weep openings in members and wall open during test.

1.4.3.3 Air Infiltration Test

Air infiltration through the wall, when tested in accordance with ASTM E283, shall not exceed 0.06 cfm per square foot of fixed wall area, plus the permissible allowance specified for operable windows within the test area.

1.4.3.4 Delamination Test

Adhesively bonded metal-faced panels shall show no evidence of delamination, warpage or other deterioration or damage when subjected to the six "Accelerated Aging Cycles" specified in ASTM D1037.

1.4.3.5 Thermal Conductance Tests

The thermal transmittance of opaque panels shall not exceed specified U-value, when tested in accordance with ASTM C1363. The average calculated thermal transmittance of the complete wall assembly including panels, windows, and all other components shall not exceed a U-value of 0.375. Determine U-values of components in accordance with ASTM C1363.

1.4.3.6 Window Tests

Provide windows that meet the same requirements for deflection and structural adequacy as specified for framing members when tested in accordance with ASTM E330/E330M, except permanent deformation shall not exceed 0.4 percent; there shall be no glass breakage, and no permanent damage to fasteners, anchors, hardware, or operating devices. Provide windows that have no water penetration when tested in accordance with ASTM E331.

1.4.3.7 Fire Resistance Tests

Insulation provided in the curtain wall system shall have a flame spread rating not exceeding 75 and a smoke developed rating not exceeding 150 when tested in accordance with ASTM E84, except as specified otherwise herein.

a. Insulation: Insulation isolated from the building interior by masonry walls, masonry cavity walls, or encased in masonry cores is not required to comply with the flame spread and smoke developed ratings specified.

b. Curtain Wall Systems: Material for firestopping the opening between the edge of the floor slab and back of the curtain wall system, shall have not less than the flame spread and smoke developed ratings specified for insulation which is neither isolated from the building interior nor encased in masonry cores.

1.4.3.8 Sound Transmission Loss Test

Sound transmission loss (TL) of the wall shall be less than 34 db, when tested in accordance with ASTM E90 for the frequency range from 125 to 400 Hz.

1.5 GLAZED CURTAIN WALL SYSTEM REQUIREMENTS

Provide system complete with framing, mullions, trim, panels, windows, glass, glazing, sealants, insulation, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing the wall to the structure as specified or indicated.

1.5.1 Source

Furnish curtain wall system components by one manufacturer or fabricator; however, all components need not be products of the same manufacturer.

1.5.2 Design

Thermally broken system with mullions, horizontal rails, and independent fixed window units. Fully coordinate system accessories directly incorporated, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.

1.5.3 Thermal Movement

Fabricate, assemble, and erect system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from 65 degrees F to 95 degrees F.

1.5.4 Tolerances

Design and erect wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified. Provide with the following tolerances:

a. Maximum variation from plane or location shown on approved shop drawings: 1/8 inch per 12 feet of length up to not more than 1/2 inch in any total length.

b. Maximum offset from true alignment between two identical members abutting end to end in line: 1/16 inch.

1.5.5 Structural Requirements

No member shall deflect in a direction parallel to the plane of the wall, when carrying its full design load, more than an amount which will reduce the edge cover or glass bite below 75 percent of the design dimension. No member after deflection under full design load, shall have a clearance between itself and the top of the panel, glass, sash, or other part immediately below it less than 1/8 inch; the clearance between the member and an operable window or door shall be minimum 1/16 inch. Design entire system to withstand the indicated wind and concentrated loads, and the following wind loads acting normal to the plane of the wall:

a. On the first two stories above grade 45 psf acting inward, and the same load acting outward.

1.5.6 Seismic Calculations

When tested to AAMA 501.4 & 501.6, system shall meet design displacement of 0.010 times the story height and ultimate displacement of 1.5 times the design displacement. Provide with the following tolerances:

a. Phase I: 3 stroke cycles using .005 times the story height - no damage or failure.

b. Phase II: 3 stroke cycles using .010 times the story height - no damage or failure.

1.6 QUALIFICATION OF WELDERS

Welding shall be performed by certified welders qualified in accordance with AWS D1.1/D1.1M using procedures, materials, and equipment of the type required for the work.

1.7 DELIVERY AND STORAGE

Inspect materials delivered to the site for damage; unload and store with a minimum of handling in accordance with recommendations contained in AAMA CW-10. Storage spaces shall be dry locations with adequate ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Deliver caulking and sealing compounds to the job site in sealed containers labeled to show the designated name, formula or specifications number; lot number; color; date of manufacturer; shelf life; and curing time when applicable.

1.7.1 Protective Covering

Prior to shipment from the factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of aluminum with protective covering of adhesive paper, waterproof tape, or strippable plastic. Covering shall not chip, peel, or flake due to temperature or weather, shall protect against discoloration and surface damage from transportation, and storage, and shall be resistant to alkaline mortar and plaster. Do not cover aluminum surfaces that will be in contact with sealants after installation.

1.7.2 Identification

Prior to delivery, mark wall components to correspond with shop and erection drawings placement location and erection.

1.8 WARRANTY

Guarantee insulating glass units not to develop material obstruction of vision as a result of dust or film formation on the inner glass surface caused by failure of the seal, other than through glass breakage, within a period of 5 years from date of acceptance of work by the Government. Replace units failing to comply with the terms of this guarantee with new units without additional cost to the Government. The Contractor shall require the manufacturer to execute their warranties in writing directly

to the Government.

1.8.1 Sample Warranties

Provide curtain wall and glazing assemblies material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard membrane manufacturer warranty to comply with the specified requirements.

a. Project Warranty: Refer to Section 01 11 00.00 25 SUMMARY OF WORK and Section 01 33 00 SUBMITTAL PROCEDURES for project warranty provisions.

b. Manufacturer's Warranty: Submit, for Owner's acceptance, Manufacturer's standard warranty document executed by authorized company official manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

c. Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of steel fire-rated glazed curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

d. Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering. Determine warranty on finish by type of finish selected.

e. Beneficiary: Issue warranty in the legal name of the project Owner.

f. Warranty Period: Five years commencing on Date of Substantial Completion, covering complete curtain wall system for failure to meet specified requirements.

g. Warranty Acceptance: Owner is sole authority who will determine acceptability of manufacturer's warranty documents.

1.9 INTERPRETATION OF AWS CODE

AWS code, when referred to herein, shall mean AWS D1.1/D1.1M, "Structural Welding Code - Steel" with the following modification:

Revise AWS code Section 1, "General Provisions," Paragraph 1.1 as follows: References to the need for approval shall mean "Approval by the Contracting Officer" and references to the "Building Commissioner" shall mean the "Contracting Officer."

1.10 QUALIFICATIONS FOR THE CURTAIN-WALL/WINDOW INSTALLER

Submit a written description of the proposed curtain-wall system installer giving the name of the curtain-wall manufacturer, qualifications of personnel, years of concurrent contracting experience, lists of projects similar in scope to the specified work, and other information as may be required by the Contracting Officer.

1.11 PERFORMANCE REQUIREMENTS

1.11.1 Allowable Design Stresses

Aluminum-alloy framing member allowable design stresses shall be in accordance with the requirements of AA ADM pertaining to building type structures made of the specified aluminum alloy.

Hot-rolled structural-steel member allowable design stresses and design rules shall be in accordance with the requirements of AISC/AISI 121 pertaining to the specified structural steel.

Cold-formed light-gage steel structural member allowable design stresses and design rules shall be in accordance with the requirements of AISI SG03-3SG570 pertaining to structural members formed from the specified structural-steel sheet or strip.

1.11.2 Design Wind Load

Design wind pressures shall be as indicated on the drawings. The ultimate design wind speed is 140 mph. Units shall be designed for hurricane impact resistance in accordance with ASCE 7-10, Sections 26.10.3.1&2.

1.11.3 Structural Capacity

Design curtain-wall system, including framing members, windows, doors and frames, metal accessories, panels, and glazing to withstand the specified design windload acting normal to the plane of the curtain wall and acting either inward or outward.

Deflection of any metal framing member in a direction normal to the plane of the curtain wall, when subjected to the test of structural performance, using the specified windload in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, shall not exceed 1/175 of the clear span of the member or 3/4 inch, whichever value is less.

Deflection of any metal member in a direction parallel to the plane of the curtain wall, when the metal member is carrying its full design load, shall not exceed 75 percent of the design clearance dimension between that member and the glass, sash, panels, or other part immediately below it.

1.11.4 Provisions for Thermal Movement

Design curtain-wall systems, including framing members, windows, doors and frames, metal accessories, and other components incorporated into the curtain wall, to allow for expansion and contraction of the component parts at an ambient temperature of 100 degrees F without causing buckling, opening of joints, overstressing of fasteners, or other harmful effects.

1.11.5 Blast Resistance Requirements for Glazing Systems

In accordance with UFC 4-010-01, exterior glazing systems shall provide a Low level of protection for a blast loading with peak pressure of 9 psi and positive phase impulse of 40 psi-msec. Comply with one or more of the following alternatives to satisfy this requirement.

1.11.5.1 Dynamic Analysis

Provide glazing systems that have been designed using dynamic analysis in

accordance with USACE PDC-TR 10-02 to achieve performance equivalent to or better than the Very Low hazard rating as defined by ASTM F2912.

1.11.5.2 Airblast Testing

Provide glazing systems that have been tested in accordance with ASTM F1642 and received a hazard rating of Very Low or better as defined by ASTM F2912.

a. Testing shall be performed on the entire proposed glazing system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the tested assembly shall replicate the method of installation to be used for the project.

b. For glazing systems that are of the same type as the tested system but of different size, the test results may be accepted if the proposed assembly is within the range from 25 percent smaller to 10 percent larger in area than the tested assembly. Proposed assemblies of a size outside this range shall require new testing to evaluate their hazard rating.

c. Results for glazing systems previously tested in accordance with protocols other than ASTM F1642 may be accepted if the required loading, hazard rating, and size limitations stated herein are satisfied.

1.11.5.3 Static Design

Provide glazing systems with framing members, connections to surrounding walls or roofs, hardware and associated connections, glazing stop connections, and other elements in shear capable of withstanding a uniform static pressure applied to all glazing surfaces equal to two times the glazing resistance determined in accordance with ASTM E1300.

a. Glazing resistance shall be equal to or greater than the equivalent 3-second duration design loading determined in accordance with ASTM F2248.

b. Glazing shall be adhered to its supporting frame by applying one of the following to both sides of the glass for single pane glazing or to the inboard side only for insulating glass units.

1. Structural silicone sealant with a bead width that is not less than 3/8-inch and at least equal to, but not larger than two times, the nominal thickness of the laminated glass pane. Minimum thickness of the bead shall be 3/16-inch.

2. Glazing tape with a width that is at least equal to two times, but not larger than four times, the nominal thickness of the laminated glass pane.

c. For primary mullions in entrances and storefronts, deflection shall be limited to 1/60 of the span length between points of structural support.

d. For intermediate mullions in entrances and storefronts and punched or ribbon window frames, deflection shall be limited to 1/60 of the supported edge length, taken as equal to the longest span of a single

glass panel, and calculated based on simple support conditions for that length.

e. Design of connections shall account for the geometry of the particular frame and connection configuration being used when calculating bending, shear, bearing, and pull-out loads.

1.12 DRAWINGS

Installation Drawings shall include the following information for curtain wall assemblies and window units.

Curtain-wall locations in building, layout and elevations, dimensions, shapes and sizes of members, thickness of metals, types and locations of shop and field connections, details of anchorage to building construction, glazing provisions, and other pertinent construction and erection details.

Location and details of anchorage devices that are to be cast-in-place in concrete and masonry construction.

Panel dimensions, thicknesses and kinds of materials, edge details, details of installation in curtain-wall framing, and other pertinent construction and erection details.

1.13 MANUFACTURER'S INFORMATION

Preventive Maintenance and Inspection shall consist of the aluminum manufacturer's recommended cleaning materials and application methods, including detrimental effects to the aluminum finish when improperly applied.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum

Shall be free from defects impairing strength or durability of surface finish. Provide standard alloys shall conform to standards and designations of AA ASD1. Special alloys, not covered by the following ASTM specifications, shall conform to standards and designations recommended by the manufacturer for the purpose intended.

2.1.1.1 Wrought Aluminum Alloys

Shall be those which include aluminum alloying elements not exceeding the following maximum limits when tested and additional in accordance with ASTM E34. These limits apply to both bare products and the core of clad products. The cladding of clad products shall be within the same limits except that the maximum zinc limit may be 2.5 percent in order to assure that the cladding is anodic to the core. Special wrought alloys with a silicon content not more than 7.0 percent will be acceptable for limited structural uses where special appearance is required:

ALLOY	PERCENT
Silicon	1.5
Magnesium, Manganese, and Chromium combined	6.0
Iron	1.0
Copper	0.4
Zinc	1.0

Within the chemical composition limits set forth above, wrought aluminum alloys shall conform to the following:

a. Extruded bars, rods, shapes and tubes: ASTM B221.

b. Sheet and Plate: ASTM B209.

2.1.1.2 Cast Aluminum Alloys

Provide those in which the alloying elements are silicon, magnesium, manganese, or a combination of these. Other elements shall not exceed the following limits:

ALLOY	PERCENT
Iron	1.2
Copper	0.4
Nickel	0.4
Titanium	0.2
Others (total)	0.5

Within the chemical composition limits set forth above, cast aluminum alloys shall conform to the following:

a. Sand castings: ASTM B26/B26M.

b. Die casting: ASTM B85/B85M.

c. Permanent mold castings: ASTM B108/B108M.

2.1.1.3 Welding Rods and Electrodes

Provide welding rods and bare electrodes shall conform to AWS A5.10/A5.10M as recommended by the manufacturer of the aluminum base metal alloy being used.

2.1.1.4 Finish

Anodized finish on aluminum surfaces shall match in appearance or fall within the two extremes of color range of the approved samples. The following designation of finishes refer to standard finishes as defined in the NAAMM AMP 500. Aluminum used for framing shall have a color anodized finish designation AA-MIO-C22-A34 and AA-MIOC22-A44, meeting the requirements of AAMA 611.

2.1.1.5 Strength

Aluminum extrusions for framing members used in curtain walls and main frame and sash or ventilator members in windows shall have a minimum ultimate tensile strength of 22,000 psi and a minimum yield strength of 16,000 psi.

2.1.2 Carbon Steel

Conform to the following specifications:

a. Rolled shapes, plates, and bars: ASTM A36/A36M.

b. Galvanized sheets: ASTM A653/A653M.

c. Sheets for porcelain enameling: ASTM A424/A424M.

d. Other sheets: ASTM A1011/A1011M or ASTM A1008/A1008M.

2.1.3 Stainless Steel

Conform to ASTM A167, Type 302 or 304, and finish in accordance with the NAAMM AMP 500 conform to Metal Finishes Manual as follows:

a. Concealed flashings: Dead soft fully annealed, 2 D finish.

b. Exposed work: No. 4 finish to match approved sample.

2.1.4 Metal Fasteners

Provide fasteners as specified in paragraph entitled "Fastener Metals for Joining Various Metal Combinations" in "Part 2 - Products" of the AAMA MCWM-1. Use metals for fasteners shall be chemically and galvanically compatible with contiguous materials.

2.1.5 Joint Sealants and Accessories

Provide manufacturer's standard colors as closely matching the adjacent surfaces as possible.

2.1.5.1 Elastomeric, Single or Multiple Component

ASTM C920, Type S, single component. Use Grade NS, nonsag type in joints on vertical surfaces and use Grade P, self-leveling or flow type, in joints on horizontal surfaces.

2.1.5.2 Single Component Silicone Rubber Base

ASTM C920, Type S, Grade NS (Silicone).

2.1.5.3 Solvents and Primers

Provide material which is quick drying, colorless, nonstaining, compatible with compound used, as recommended by sealant manufacturer. Where primer is specified or recommended by sealant manufacturer, tests related to that material shall include primer.

2.1.5.4 Backing Material

Provide material which is nonstaining, nonabsorbent, and compatible with sealing compound. Closed cell resilient urethane, polyvinylchloride or polyethylene foam; closed-cell sponge of vinyl or rubber; closed cell neoprene or butyl rod; or polychloroprene tubes or beads.

2.1.5.5 Bond Preventive Materials

Provide polyethylene tape with pressure-sensitive adhesive; aluminum foil or waxed paper.

2.1.5.6 Preformed Sealing Compound

Provide nonskinning type conforming to AAMA 800. Tapes, beads, ribbons or other shapes as required.

2.1.6 Glass and Glazing

Materials are specified under Section 08 81 00 GLAZING. Conform to ASTM C1036, except ASTM C1048 for spandrel glass. All glazing material must be certified as meeting 16 CFR 1201.

2.1.6.1 Glass Sizes and Clearances

Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip to remove flares or to reduce oversized dimensions.

2.1.6.2 Glass Setting Materials

a. Sealants and preformed sealing compounds: Shall be as specified under paragraph entitled "Joint Sealant and Accessories."

b. Preformed compression gaskets and seals: ASTM C864, color black. Exposed gaskets shall have durable compatible, and colorfast coating.

c. Preformed lock-strip type gaskets: ASTM C542, factory formed, color black. Provide separate filler or locking strips, approximately 10 Shore "A" Durometer points harder than gasket body, and insure permanent and continuous pressure of sealing lips. Butt or miter grooves 45 degrees.

d. Setting blocks, edge blocks, and spacer shims: Fabricate from neoprene or other materials recommended by glass manufacturer compatible with compounds, sealants, or gaskets used. Unless otherwise recommended by the glass manufacturer, shore "A" Durometer hardness for setting and edge blocks shall be 90 plus or minus 5; for spacer shims, 50 plus or minus 5.

2.1.7 Paint and Finishes

2.1.7.1 Primer

Zinc-molydate, alkyd type.

2.1.8 Metal Windows Thermally Broken

Fixed. AAMA/WDMA/CSA 101/I.S.2/A440 as modified herein to match curtain wall/entrance/storefronts systems. Comply with glass clearance dimensions and sealant dimensions recommended by glass manufacturer.

2.1.8.1 Frames

Frames for fixed glazed panels and window units shall be aluminum to match curtain wall/entrance/storefronts systems.

2.1.9 Metal Accessories

Fabricate accessories of sizes and shapes indicated from similar materials and finish as specified for wall system.

2.2 METALS FOR FABRICATION

2.2.1 Aluminum-Alloy Extrusions

Extrusions shall conform to ASTM B221.

Extrusions to receive an integral-color anodic coating shall be the alloy and temper recommended by the aluminum producer for the specified finish with integral-color anodic coating and have mechanical properties equal to or exceeding those of 6063-T5.

2.2.2 Aluminum-Alloy Sheets and Plates

Unless otherwise specified, sheets and plates shall conform to ASTM B209, Alloy 3003-H16.

Sheets and plates to receive a clear anodic coating shall conform to ASTM B209, Alloy 5005-H16.

Sheets and plates to receive an integral-color anodic coating shall be the alloy and temper recommended by the aluminum producer for the specified coating and have mechanical properties equal to or exceeding those of 5005-H16.

2.2.3 Structural Steel

Hot-rolled shapes, plates, and bars shall conform to ASTM A36/A36M.

Hot-formed tubing shall conform to ASTM A501/A501M.

Sheet and strip for cold-formed, light-gage, structural members shall conform to ASTM A1011/A1011M.

2.2.4 Metals for Fasteners

Provide aluminum-alloy bolts and screws made from rod conforming to ASTM B211, Alloy 2024-T351.

Provide aluminum-alloy nuts made from rod conforming to ASTM B211, Alloy 6061-T6.

Provide aluminum-alloy washers made from sheet conforming to ASTM B209, Alloy 2024-T4.

Provide aluminum-alloy rivets made from rod or wire conforming to ASTM B316/B316M, Alloy 6053-T61.

Provide steel fasteners made from corrosion-resistant chromium-nickel Type 302, 303, 304, 305, or 316 with the form and condition best suited for the work.

2.3 NONSKINNING SEALING COMPOUND

Sealing compound shall be nonskinning, gun-grade type conforming to AAMA 800.

2.4 FABRICATION

2.4.1 Workmanship

Metal Accessories shall be accurately formed; joints, except those designed to accommodate movement, accurately fitted and rigidly assembled.

Insofar as practical, fitting and assembly of the work shall be done in the manufacturer's plant. Mark work that cannot be permanently factory-assembled before shipment to ensure proper assembly at the site.

2.4.2 Shop-Painting Aluminum

Shop prime aluminum surfaces that will come in contact with dissimilar metals, masonry, concrete, or wood.

Prepare aluminum surfaces for painting in accordance with ASTM D1730, Type B, Method 2 or 3.

Give aluminum surfaces one shop coat of paint applied to dry, clean, surfaces to provide a continuous minimum dry-film thickness of 1.5 mils.

2.4.3 Shop-Painting Steel

Shop prime surfaces of concealed steel.

Remove scale, rust, and other deleterious materials. Remove heavy rust and loose mill scale in accordance with SSPC SP 3 or SSPC 7/NACE No.4. Remove oil, grease, and similar contaminants in accordance with SSPC SP 1.

Give steel surfaces two coats of paint; the second coat shall have a color different from the first coat. Apply paint to dry, clean, surfaces to provide a continuous minimum dry-film thickness of 1.5 mils for the first coat and 1 mil for the second coat.

2.4.4 Depth of Glazing Rabbets

Depth of glazing rabbets for openings to receive glass materials or panels shall be as follows:

MATERIAL	NOMINAL THICKNESS	MAXIMUM SIZE	MINIMUM RABBET DEPTH
Double-glazing units	All thicknesses	Up to 25 square feet	5/8 inch
	All thicknesses	25 to 70 square feet	3/4 inch
Panels	Up to 1 inch	All sizes	5/8 inch
	1 to 1-1/2 inches	All sizes	3/4 inch

2.4.5 Finish

Exposed-to-View Aluminum Finish of surfaces must be:

Frosted finish with Class I clear anodic coating: Medium-matte chemical etch and Architectural Class I (0.7-mil and greater thickness) anodic coating producing a natural aluminum color. Finish shall be AA C22-A41 in accordance with AA DAF45, unless noted otherwise.

Match aluminum-finish color and appearance to that of the sample approved for use in the project within the aluminum producer's standard color range.

Test the anodic coating on aluminum for thickness in accordance with ASTM B244.

Test anodically coated aluminum for the weight of the coating in accordance with ASTM B137.

Test the resistance of anodically coated aluminum to staining by dyes in accordance with ASTM B136.

2.5 CURTAIN-WALL FRAMING MEMBERS

2.5.1 General

Framing members shall be the section dimensions and arrangement indicated and designed to accommodate windows, panels, and other materials to be incorporated into the curtain-wall system.

Curtain-wall framing shall be the grid type with both the vertical and horizontal mullions extending the indicated distance beyond the exterior face of the curtain wall.

2.5.2 Construction

Framing members shall be aluminum-alloy extrusions with a wall thickness not less than 0.125 inch. Glazing rabbet legs shall be an integral part of the frame with the leg depth not less than the minimum depth specified for the thickness and size of the glass material or panel to be installed in the curtain-wall frame. Design and construct frames to receive window sash and louvers of the type specified when required.

Prepare vertical mullions for anchorage to the building construction at the bottom, at each intermediate floor elevation, and at the top.

Corners of frames shall be coped and welded construction. Welds shall be on the unexposed surfaces. Corner joints shall be accurately fitted and

flush, with watertight hairline joints not exceeding 1/64 inch in width.

2.6 METAL ACCESSORIES

2.6.1 Sills

Sills shall be the shapes and dimensions indicated and fabricated of aluminum-alloy extrusions having a wall thickness not less than 0.125 inch.

Sills shall run continuously under the curtain wall and permit the lower curtain wall frame member to interlock without fastenings.

2.7 SEALANTS AND CAULKINGS

Sealants and caulkings are specified in Section 07 92 00 JOINT SEALANTS.

2.8 CURTAIN-WALL INSTALLATION MATERIALS

2.8.1 Masonry Anchorage Devices

2.8.2 Toggle Bolts

Toggle bolts shall be the tumble-wing type.

2.8.3 Steel Bolts, Nuts, and Washers

Bolts shall be regular hexagon head, low-carbon steel.

Nuts shall be hexagon, regular style, carbon steel.

Plain washers shall be round, general-assembly purpose, carbon steel.

Lockwashers shall be helical spring, carbon steel.

2.8.4 Machine Screws

Provide screws for concealed work that are corrosion-resistant steel, slotted or cross-recessed type, roundhead.

Provide screws for exposed-to-view work that are corrosion-resistant steel, cross-recessed, flathead.

2.8.5 Electrodes for Welding Steel

Electrodes for welding steel by the manual shielded metal arc welding process shall meet the requirements of AWS D1.1/D1.1M and be covered mild-steel electrodes conforming to AWS A5.1/A5.1M, E60 series.

PART 3 EXECUTION

3.1 GENERAL

Install curtain walls and accessories in accordance with the approved drawings and as specified.

3.2 FABRICATION

Provide curtain wall components of the materials and thickness indicated or specified. The details indicated are representative of the required

design and profiles. Acceptable designs may differ from that shown if the proposed system components conform to the limiting dimensions indicated and the requirements specified herein. Unless specifically indicated or specified otherwise, the methods of fabrication and assembly shall be at the discretion of the curtain wall manufacturer. Perform fitting and assembling of components in the shop to the maximum extent practicable. Provide anchorage devices shall permit adjustment in three directions. Exposed fastenings used on finished surfaces shall be truss head, flat head, or oval head screws or bolts.

3.2.1 Joints

Provide welded or mechanical fasteners as indicated or specified. Match joints in exposed work to produce continuity of line and design. Bed-joints or rabbets receiving caulking or sealing material shall be minimum 3/4 inch deep and 3/8 inch wide at mid ambient temperature range.

3.2.2 Welding

Conform to AWS D1.1/D1.1M. Use methods and electrodes recommended by manufacturers of base metal alloys. Provide welding rods of an alloy that matches the color of the metal being welded. Protect glass and other finish from exposure to welding spatter. Ground and finish weld beads on exposed metal surfaces to minimize mismatch and to blend with finish on adjacent parent metal. If flux is used in welding aluminum, completely remove it immediately upon completion of welding operations. Do not use exposed welds on aluminum surfaces.

3.2.3 Soldering and Brazing

Provide as recommended by suppliers. Solder only for filling or sealing joints.

3.2.4 Ventilation and Drainage

Provide internal ventilation drainage system of weeps or based on principles of pressure equalization to ventilate the wall internally and to discharge condensation and water leakage to exterior as inconspicuously as possible. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.

3.2.5 Protection and Treatment of Metals

3.2.5.1 General

Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving the shop.

3.2.5.2 Galvanic Action

Provide protection against galvanic action wherever dissimilar metals are in contact, except in the case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.

3.2.5.3 Protection for Aluminum

Protect aluminum which is placed in contact with, built into, or which will receive drainage from masonry, lime mortar, concrete, or plaster with one coat of alkali-resistant bituminous paint. Where aluminum is contacted by absorptive materials subject to repeated wetting or treated with preservative noncompatible with aluminum, apply two coats of aluminum paint, to such materials and seal joints with approved caulking compound.

3.3 INSTALLATION

Installation and erection of glazed wall system and all components shall be performed under direct supervision of and in accordance with approved recommendations and instructions of wall system manufacturer or fabricator.

3.3.1 Bench Marks and Reference Points

Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of the marks, stop erection work in that area until discrepancies have been corrected.

3.3.2 Verifying Conditions and Adjacent Surfaces

After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in the building frame.

3.3.3 Windows

Install windows in accordance with details indicated and approved detail drawings.

3.3.3.1 Sealing

Seal exterior metal to metal joints between members of windows, frames, mullions, and mullion covers. Remove excess sealant.

3.3.3.2 Ventilators and Hardware

After installing and glazing windows, adjust ventilators and hardware to operate smoothly and to be weathertight when ventilators are closed and locked. Lubricate hardware and moving parts.

3.3.3.3 Weatherstripping

Install to make weathertight contact with frames when ventilators are closed and locked. Do not cause binding of sash or prevent closing and locking of ventilator.

Provide for ventilating sections of all windows to insure a weather-tight seal meeting the infiltration tests specified. Use easily replaceable factory-applied weatherstripping of manufacturer's stock type. Use molded vinyl, molded or molded-expanded neoprene for weatherstripping for compression contact surfaces. For sliding surfaces, use treated woven pile or wool, polypropylene or nylon pile with nylon fabric and metal or plastic backing strip weatherstripping. Do not use neoprene or polyvinyl

chloride weatherstripping where they will be exposed to direct sun light.

3.3.4 Joint Sealants

3.3.4.1 Surface Preparation

Surfaces to be primed and sealed shall be clean, dry to the touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 1/8 inch. Do not apply compound unless ambient temperature is between 40 and 90 degrees F. Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.

3.3.4.2 Applications

Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 5 gallons.

3.3.4.3 Primer

Apply to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after caulking is completed.

3.3.4.4 Backing

Tightly pack in bottom of joints which are over 1/2 inch in depth with specified backing material to depth indicated or specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.

3.3.4.5 Bond Prevention

Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.

3.3.4.6 Protection and Cleaning

Remove compound smears from surfaces of materials adjacent to sealed joints as the work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of caulking and sealing, remove remaining smears, stains, and other soiling, and leave the work in clean neat condition.

3.3.5 Glass

Install in accordance with manufacturer's recommendations as modified herein.

3.3.5.1 Inspection of Sash and Frames

Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.

3.3.5.2 Preparation of Glass and Rabbets

Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer.

3.3.5.3 Positioning Glass

Set glass from inside the building unless otherwise indicated or specified. Maintain specified edge clearances and glass bite at perimeter. Maintain position of glass in rabbet and provide required sealant thickness on both sides of glass. For glass dimensions larger than 50 united inches, provide setting blocks at sill and spacer shims on all four sides; locate setting blocks one quarter way in from each jamb edge of glass. Where setting blocks and spacer shims are set into glazing compound or sealant, butter with compound or sealant, place in position, and allow to firmly set prior to installation of glass.

3.3.5.4 Setting Methods

Apply glazing compound, glazing sealant, glazing tape, and gaskets uniformly with accurately formed corners and bevels. Remove excess compound from glass and sash. Use only recommended thinners, cleaners, and solvents. Strip surplus compound from both sides of glass and tool at slight angle to shed water and provide clean sight lines. Secure stop beads in place with suitable fastenings. Do not apply compound or sealant at temperatures lower than 40 degrees F, or on damp, dirty, or dusty surfaces. After glazing, fix ventilators in sash so they cannot be operated until compound or sealant has set.

a. Use structural sealant glazing to completely fill channel on edges and on both sides of glass per manufacturer's instructions.

3.3.5.5 Void Space

Heat absorbing, insulating, spandrel, and tempered glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding the sealant.

3.3.5.6 Insulating Glass

Provide adequate means to weep incidental water and condensation away from the sealed edges of insulated glass units and out of the wall system. The weeping of lock-strip gaskets should be in accordance with the recommendation of the glass manufacturer.

3.3.5.7 Insulating Glass With Edge Bands

Insulating glass with flared metal edge bands set in lock-strip type gaskets: Follow glass manufacturer's recommendations and add

supplementary wet seal as required; when used with glazing tape, use tapered tape.

3.4 FINISHES

3.4.1 Galvanizing

Conform to ASTM A123/A123M, ASTM A153/A153M, and ASTM A653/A653M, as applicable.

3.4.1.1 Repair of Zinc-Coated Surfaces

Repair zinc coated surfaces damaged by welding or other means with galvanizing repair paint or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved.

3.4.2 Shop Cleaning and Painting

3.4.2.1 Cleaning

Clean steel and iron work by power wire brushing or other approved manual or mechanical means, for removal of rust, loose paint, scale, and deleterious substances. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other foreign matter, with solvents until thoroughly clean. Cleaning steel embedded in concrete is not required.

3.4.2.2 Painting Steel or Iron Surfaces

Apply one coat of primer. Apply primer to a minimum dry film thickness of 1.0 mil. Apply additional shop coat of specified paint, to which a small amount of tinting material has been added, on surfaces that will be concealed in the finished construction or that will not be accessible for finish painting. Accomplish painting in dry weather or under cover, and on steel or iron surfaces that are free from moisture and frost. Do not paint surfaces of items to be embedded in concrete. Recoat damaged surfaces upon completion of work. Prime coat steel immediately after cleaning. Do not apply bituminous protective coatings to items to be finish painted.

3.4.2.3 Painting Weathering Steel

Clean and paint surfaces which will not be exposed to the weather with one shop or field coat of specified primer, or other approved rust-inhibitive primer. Clean and strip-paint weathering steel contact surface to be covered by structural or compression gaskets or sealants with one coat to insure positive seal.

3.5 FIELD TESTS

Conduct field check test for water leakage on designated wall areas after erection. Conduct test on two wall areas, two bays wide by two stories high where directed. Conduct test and take necessary remedial action as described in AAMA 501.1.

3.6 CLEANING AND PROTECTION

3.6.1 General

At the completion of the installation, clean the work to remove mastic

smears and other foreign materials.

3.6.2 Glass

Upon completion of wall system installation, thoroughly wash glass surfaces on both sides and remove labels, paint spots, putty, compounds, and other defacements. Replace cracked, broken, and defective glass with new glass at no additional cost to the Government.

3.6.3 Aluminum Surfaces

Protection methods, cleaning, and maintenance shall be in accordance with AAMA 609 & 610.

3.6.4 Other Metal Surfaces

After installation, protect windows, panels, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods must be in accordance with recommendations of product manufacturers or of the respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or the respective trade association.

3.7 MATERIALS EMBEDDED IN OTHER CONSTRUCTION

Install materials to be embedded in cast-in-place concrete and masonry prior to the installation of the curtain wall. Provide setting drawings, templates, and instructions for installation.

3.8 FASTENING TO CONSTRUCTION-IN-PLACE

Provide anchorage devices and fasteners for fastening work to construction-in-place. Provide fasteners as specified.

3.9 SETTING MASONRY ANCHORAGE DEVICES

Set devices in masonry or concrete-in-place construction in accordance with the manufacturer's printed instructions. Leave drilled holes rough and free of drill dust.

3.10 FIELD-WELDING STEEL AND TOUCHUP PAINTING

Procedures of manual shielded metal arc welding, the appearance and quality of the welds made, and the methods used in correcting welding work shall conform to AWS D1.1/D1.1M.

After completion of welding, clean and paint field welds and scarred surfaces on steel work and on adjacent ferrous-metal surfaces. Paint shall be the same as that used for shop painting.

3.11 INSTALLATION TOLERANCES

Install curtain walls within the following tolerances:

Deviation in location from that indicated on the drawings	Plus or minus 1/4 inch
Deviation from the plumb or horizontal	
n 12 feet of length	Not more than 1/8 inch
In any total length	Not more than 1/2 inch
Offset from true alignment at joints between abutting members in line	Not more than 1/16 inch

3.12 PLACING CURTAIN-WALL FRAMING MEMBERS

Install members plumb, level, and within the limits of the installation tolerances specified.

Connect members to building framing. Provide supporting brackets adjustments for the accurate location of curtain-wall components. Adjustable connections shall be rigidly fixed after members have been positioned.

3.13 INSPECTION AND ACCEPTANCE PROVISIONS

3.13.1 Finished Curtain-Wall System Requirements

Curtain-wall work shall be rejected for any of the following deficiencies:

Finish of exposed-to-view aluminum having color and appearance that are outside the color and appearance range of the approved samples.

Installed curtain-wall components having stained, discolored, abraded, or otherwise damaged exposed-to-view surfaces that cannot be cleaned or repaired.

Aluminum surfaces in contact with dissimilar materials that are not protected as specified.

3.13.2 Repair of Defective Work

Remove and replace defective work with curtain-wall materials that meet the specifications at no expense to the Government.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.18	(2012) Materials and Finishes
ANSI/BHMA A156.4	(2008) Door Controls - Closers

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2009) Accessible and Usable Buildings and Facilities
ICC IBC	(2012) International Building Code
ICC/ANSI A117.1	(2009) Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2012; Amendment 1 2012) Life Safety Code
NFPA 105	(2013) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 70	(2011; Errata 2 2012) National Electrical Code
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2009) Standard for Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures

and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

b. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

c. Content: Include the following information:

    1. Type, style, function, size, label, hand, and finish of each door hardware item.

    2. Manufacturer of each item.

    3. Fastenings and other pertinent information.

    4. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

    5. Explanation of abbreviations, symbols, and codes contained in schedule.

    6. Mounting locations for door hardware.

    7. Door and frame sizes and materials.

    8. Warranty information for each product.

d. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores. Provide a "key chart" that is a spreadsheet (one row per door) with columns for: door number, room name, and lock code/serial number. Key Chart is for final use by lock/key vendor to prepare sub-master and master keys.

Informational Submittals:

a. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

SD-02 Shop Drawings

Shop Drawings: Details of electrified access control hardware indicating the following:

a. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

1. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

2. Complete (risers, point-to-point) access control system block wiring diagrams.

3. Wiring instructions for each electronic component scheduled herein.

b. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

SD-03 Product Data

Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

SD-10 Operation and Maintenance Data

Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.3 SUMMARY

This Section includes commercial door hardware for the following:

a. Swinging doors.

b. Other doors to the extent indicated.

Door hardware includes, but is not necessarily limited to, the following:

a. Mechanical door hardware.

b. Electromechanical door hardware.

c. Cylinders specified for doors in other sections.

Related Sections:

a. Division 08, Section "Door Hardware Schedule."

b. Division 08, Section "Hollow Metal Doors and Frames."

c. Division 08, Section "Flush Wood Doors."

Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

a. ICC A117.1 - Accessible and Usable Buildings and Facilities.

b. ICC IBC - International Building Code.

c. NFPA 70 - National Electrical Code.

d. NFPA 80 - Fire Doors and Windows.

e. NFPA 101 - Life Safety Code.

f. NFPA 105 - Installation of Smoke Door Assemblies.

g. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.

h. State Building Codes, Local Amendments.

Standards: All hardware specified herein shall comply with the following industry standards:

a. ANSI/BHMA Certified Product Standards - A156 Series.

b. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

1.4 QUALITY ASSURANCE

Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

a. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

b. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

Keying Conference: Conduct conference to comply with requirements in Division 01, Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

a. Function of building, purpose of each area and degree of security required.

b. Plans for existing and future key system expansion.

c. Requirements for key control storage and software.

d. Installation of permanent keys, cylinder cores and software.

e. Address and requirements for delivery of keys.

Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01, Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

a. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

b. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

c. Review sequence of operation narratives for each unique access controlled opening.

d. Review and finalize construction schedule and verify availability of materials.

e. Review the required inspecting, testing, commissioning, and demonstration procedures.

At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project Site without prior authorization.

Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference."

1.6 COORDINATION

Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of the hardware.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Electrical component defects and failures within the systems operation.

Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

Special Warranty Periods:

a. Ten years for mortise locks and latches.

b. Ten years for extra heavy duty cylindrical (bored) locks and latches.

c. Seven years for heavy duty cylindrical (bored) locks and latches.

d. Five years for standard duty cylindrical (bored) locks and latches.

e. Five years for exit hardware.

f. Twenty five years for manual surface door closer bodies.

g. Ten years for heavy duty floor closers.

h. Two years for shallow depth floor closers.

i. Two years for overhead concealed closers.

j. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified

continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

a. Acceptable Manufacturers:

1. Hager Companies (HA).

2. McKinney Products (MK).

3. Pemko Manufacturing (PE).

2.3 MECHANICAL LOCKS AND LATCHING DEVICES

Residential Tubular Locking Devices: Standard ANSI A156.2, Series 4000, Grade 2.

a. Tubular locksets, deadbolts, and handlesets designed to fit ANSI standard door and frame preps.

b. Locks are to be non-handed and have adjustable backset.

c. Acceptable Manufacturers:

1. Schlage (SC) - F Series.

2. Yale Residential (YR) - YH Series.

2.4 DOOR CLOSERS

Door Closers, Surface Mounted (Standard Duty): ANSI/BHMA A156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

a. Acceptable Manufacturers:

1. Corbin Russwin Hardware (RU) - DC3000 Series.

2. LCN Closers (LC) - 1260-SLIM Series.

3. Sargent Manufacturing (SA) - 1331 Series.

2.5 AUTOMATIC DOOR OPERATORS

General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

a. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

Electromechanical Door Operators: Self-contained units powered by permanent magnet dc motor, with closing speed controlled mechanically by gear train, connections for power, activation and safety device wiring, and manual operation including spring closing when power is off.

Electrohydraulic Door Operators: Self-contained low-pressure units with rack and pinion design contained within a cast aluminum housing. Door closing speed controlled by independent hydraulic adjustment valves in the sweep and latch range of the closing cycle. Operator is to provide conventional door closer opening and closing forces unless the power operator motor is activated. Unit is to include an adjustable hydraulic backcheck valve to cushion the door speed if opened violently. Non-handed units for both push and pull side applications.

Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

Standard: Certified ANSI/BHMA A156.19.

a. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.

2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

Configuration: Surface mounted. Door operators to control single swinging and pair of swinging doors.

Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

a. On-off switch to control power to be key switch operated.

Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

Activation Devices: Provide activation devices in accordance with ANSI/BHMA A156.19 standard, for condition of exposure indicated and for long term, maintenance-free operation under normal traffic load operation. Coordinate activation control with electrified hardware and access control interfaces. Activation switches are standard SPST, with optional DPDT availability.

Signage: As required by cited ANSI/BHMA A156.19 standard for the type of operator.

a. Acceptable Manufacturers:

1. Besam Automated Entrance Systems (BM) - SW100 Series.

2. LCN Closers (LC) - 4640 Series.

3. Norton Door Controls (NO) - 6000 Series.

2.6 ELECTRONIC ACCESSORIES

Key Switches: Key switches furnished standard with stainless-steel single gang face plate with a 12/24 volts dc bi-color LED indicator. Integral backing bracket permits integration with any 1-1/4 inch or 1-1/2 inch mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

a. Acceptable Manufacturers:

1. Security Door Controls (SD) - 800 Series.

2. Securitron (SU) - MK Series.

2.7 FABRICATION

Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.8 FINISHES

Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

a. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

a. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

b. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

c. Where indicated to comply with accessibility requirements, comply with ICC/ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

d. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07, Section "Joint Sealants."

Storage: Provide a secure lockup for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

Clean adjacent surfaces soiled by door hardware installation.

Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 HARDWARE SCHEDULE

The following schedule is furnished for whatever assistance it may afford the Contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware heading, provide door or item with hardware same as required for similar purposes. Hardware supplier is responsible for handing and sizing all products as listed in the hardware heading. Quantities listed are for each pair of doors, or for each single door.

a. MK - McKinney.

b. PE - Pemko.

c. SA - Sargent.

d. 00 - Other.

e. YA - Yale.

f. RO - Rockwood.

g. RF - Rixson.

h. NO - Norton.

i. SU - Securitron.

Hardware Schedule

Set: 1.0				
Doors: 100Aa				
Description: Exterior Alum Pair - Panics; Pulls; Key; Auto Operator				
2	Continuous Hinge (A31021G)	CFM__SLI-HD1		PE
2	CVR Exit Device (Type 8, F12)	16 72 AD8610 106 862	US32D	SA
5	Core (SFIC)	InstaKey (match facility standard)	US26D	00
1	Cylinder	72 42	US26D	SA
2	Concealed OH Stop (C01541)	1-X36	630	RF
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Door Operator	6060; 6070 D	689	NO
1	Threshold (J36100)	2009APK MSES10 (or per detail)		PE
1	Gasketing	By Door Assembly Manufacturer		00
2	Door Switch	501		NO
1	Keyswitch	MK		SU
Notes: Exit devices must be manually dogged for auto operator to function. Key switch turns operator on/off.				

Set: 2.0				
Doors: 100Ab, 100Bb				
Description: Interior Alum Pair - Panics; Pulls; Key; Auto Operator				
2	Continuous Hinge (A31021G)	CFM__SLI-HD1		PE
2	CVR Exit Device (Type 8, F12)	16 72 AD8610 106 862	US32D	SA
1	Cylinder	72 42	US26D	SA
2	Concealed OH Stop (C01541)	1-X36	630	RF

1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Door Operator	6060; 6070 D	689	NO
1	Threshold (J32130)	271A MSES10SS (or per detail)		PE
1	Gasketing	By Door Assembly Manufacturer		00
2	Door Switch	501		NO
1	Keyswitch	MK		SU
Notes: Exit devices must be manually dogged for auto operator to function. Key switch turns operator on/off.				

Set: 3.0				
Description: NOT USED - Interior Alum Pair at Connector - Panics; Pulls; Key				
2	Continuous Hinge (A31021G)	CFM__SLI-HD1		PE
2	CVR Exit Device (Type 8, F12)	16 72 AD8610 106 862	US32D	SA
4	Core (SFIC)	InstaKey (match facility standard)	US26D	00
2	Concealed OH Stop (C01541)	1-X36	630	RF
2	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Threshold (J32130)	271A MSES10SS (or per detail)		PE
1	Gasketing	By Door Assembly Manufacturer		00

Set: 4.0				
Description: NOT USED - Exterior Alum Sgl - Panic; Pull; Key				
1	Continuous Hinge (A31021G)	CFM__SLI-HD1		PE

1	Rim Exit Device (Type 1, F03)	16 72 8804 862	US32D	SA
1	Core (SFIC)	InstaKey (match facility standard)	US26D	00
1	Concealed OH Stop (C01541)	1-X36	630	RF
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Threshold (J36100)	2009APK MSES10 (or per detail)		PE
1	Gasketing	By Door Assembly Manufacturer		00

Set: 5.0				
Doors: 104b, 107, 204, 207, 304, 307, 404, 407, 504, 507				
Description: Stair - Panic; Passage Trim				
3	Heavyweight Hinge (A8111)	TA786	US26D	MK
1	Fire Exit Device (Type 1, F14)	12 8815 ETL	US32D	SA
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Kick Plate (J102)	K1050 10" 4BE CSK	US32D	RO
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
1	Threshold (J32130)	271A MSES10SS (or per detail)		PE
1	Head-Jamb Gasketing (ROE154)	S88BL		PE

Set: 6.0				
Doors: 101a, 101b, 101c, 101d, 103, 109, 114, 115, 201a, 201b, 201c, 201d, 201e, 205, 209, 301a, 301b, 301c, 301d, 301e, 309, 401a, 401b, 401c, 401d, 401e, 409, 501a, 501b, 501c, 501d, 501e, 509, 510a, 510b				
Description: Fire Alarm; Mech; Elec; Jan; Sprink - Storeroom Lock				
3	Heavyweight Hinge (A8111)	TA786	US26D	MK
1	Storeroom Lock (F07)	72 8204 LNL	US26D	SA

1	Core (SFIC)	InstaKey (match facility standard)	US26D	00
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Kick Plate (J102)	K1050 10" 4BE CSK	US32D	RO
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
1	Threshold (J32130)	271A MSES10SS (or per detail)		PE
1	Head-Jamb Gasketing (ROE154)	S88BL		PE

Set: 7.0				
Doors: 108, 110, 113, 203, 206, 208, 303, 305, 306, 308, 403, 405, 406, 408, 503, 505, 506, 508				
Description: Laundry; Break Room; Storage; Supply Room; Hskpg; Mail - Card Access				
3	Heavyweight Hinge (A8111)	TA786	US26D	MK
1	Card Access Lock	Reuse Existing ONITY HT 24/28+ ANSI lock-set. Coordinate with NGIS for Operational requirements.		00
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Kick Plate (J102)	K1050 10" 4BE CSK	US32D	RO
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
1	Head-Jamb Gasketing (ROE154)	S88BL		PE

Set: 8.0				
Doors: 111, 112				
Description: Restroom - Privacy Set				
3	Heavyweight Hinge (A8111)	TA786	US26D	MK

1	Privacy Set (F22 w/ indicator)	49 8265 LNL	US26D	SA
1	Closer (PT 4C, C02011, C02021)	351 O; P10	EN	SA
1	Kick Plate (J102)	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate (J103)	K1050 6" 4BE CSK	US32D	RO
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
3	Silencer (L03011)	608		RO

Set: 9.0

Doors: A1, B1

Description: Unit Entry (STC40)

3	Hinge (A8112)	TA714	US26D	MK
1	Card Access Lock	Reuse Existing ONITY HT 24/28+ ANSI lock-set. Coordinate with NGIS for Operational requirements.		00
1	Closer (PT 4C, C02011, C02021)	1331 Series	EN	SA
1	Kick Plate (J102)	K1050 10" 4BE CSK	US32D	RO
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
1	Threshold (J32130)	2366A MSES10SS (or per detail)		PE
1	Head-Jamb Gasketing (ROE154)	S773BL		PE
1	Head-Jamb Gasketing (ROE154)	S44BL		PE
1	Door Bottom	3692APK773BL		PE
1	Viewer (L03221, L03171)	622	DCRM	RO

Notes: Provide 2nd viewer at ADA units. Coordinate threshold with flooring.

Set: 10.0

Doors: A2, A3, B2, B3				
Description: Unit Bedroom; Bathroom				
3	Hinge (A8112)	TA714	US26D	MK
1	Privacy Set (ANSI grade 2)	YH21 Augusta	626	YA
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
3	Silencer (L03011)	608		RO

Set: 11.0				
Doors: B5				
Description: Unit Closet				
3	Hinge (A8112)	TA714	US26D	MK
1	Passage Set (ANSI grade 2)	YH11 Augusta	626	YA
1	Door Stop (L02101; L02141)	400(wall); 441CU(floor)	US26D	RO
3	Silencer (L03011)	608		RO

Set: 12.0				
Doors: A4, B4				
Description: Unit Closet Bypass				
1	Bypass Door Hdwe	HBP200A		PE
2	Flush Pull	872	US26D	RO

-- End of Section --

SECTION 08 81 00

GLAZING
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM C1184	(2014) Standard Specification for Structural Silicone Sealants
ASTM C509	(2006; R 2011) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C864	(2005; R 2011) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM D395	(2014) Standard Test Methods for Rubber Property - Compression Set
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2010) Rating Sound Insulation
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual
GANA Standards Manual	(2001) Tempering Division's Engineering

Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2004) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use
IGMA TR-1200	(1983; R 2007) Guidelines for Commercial Insulating Glass Dimensional Tolerances

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2014) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2014) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass

Documentation for Energy Star qualifications.

Plastic Glazing

Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

Environmental Data

SD-04 Samples

Insulating Glass

Plastic Sheet

Glazing Compound

Glazing Tape

Sealant

Two 8 by 10 inch samples of each of the following: tinted glass, patterned glass, heat-absorbing glass, and insulating glass units.

Three samples of each indicated material. Samples of plastic sheets shall be minimum 5 by 7 inches.

SD-07 Certificates

Insulating Glass

Plastic Glazing

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

Glazing Accessories

Certificates from the manufacturer attesting that the units meet the luminous and solar radiant transmission requirements for heat absorbing glass.

SD-08 Manufacturer's Instructions

Setting and sealing materials

Glass setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified. Include cleaning instructions for plastic sheets.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.4 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.5 WARRANTY

1.5.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal or as a result of delamination, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.5.2 Warranty for Polycarbonate Sheet

For a 5-year period following acceptance of the work:

a. Warranty Type I, Class A (UV stabilized) sheets against breakage;

b. Warranty Type III (coated, mar-resistant) sheets against breakage and against coating delamination;

c. Warranty Type IV (coated sheet) against breakage and against yellowing;

d. Warranty extruded polycarbonate profile sheet against breakage.

For a 10-year period following acceptance of the work, warranty Type IV against yellowing and loss of light transmission.

1.5.3 Monolithic Opacified Spandrel

Manufacturer shall warrant the opacifier film on the spandrel to be free of peeling for a period of five years after Date of Substantial Completion. Warranty shall be signed by manufacturer.

PART 2 PRODUCTS

2.1 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

Type I, Class 1 (clear), Quality q4 (A). Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 1/8 inch float glass for openings up to and including 15 square feet, 3/16 inch for glazing openings over 15 square feet but not over 30 square feet, and 1/4 inch for glazing openings over 30 square feet but not over 45 square feet.

2.1.2 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, 90 percent light transmittance, 100 percent shading coefficient, conforming to ASTM C1036. Color shall be clear.

2.1.3 Tempered Glass (GL-2)

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick, 86 percent light transmittance, 89 percent shading coefficient conforming to ASTM C1048 and GANA Standards Manual. Color shall be clear. Provide wherever safety glazing material is indicated or specified.

2.1.4 Spandrel Glass (GL-4)

2.1.4.1 Film-Opacified Spandrel Glass

Where Film-opacified Spandrel glass is indicated provide Insulating glass units with 4 mils thick opaque (black) film attached to the No. 4 surface. Provide Opaque film on number 4 surface of existing window units where indicated.

2.1.5 Fire/Safety Rated Glass (GL-3)

Fire/safety rated glass Type I transparent flat type, Class 1-clear. Glass shall have a 60 or 120 minute as indicated when tested in accordance with ASTM E119. Glass shall be permanently labeled with appropriate markings.

2.1.5.1 Fire Rated, Safety Rated Glass Ceramic (GL-3)

Nominal 5/16 inch thick laminated glazing. Basis of Design TGP Firelite Plus 60 minute.

2.2 INSULATING GLASS UNITS (GL-1)

Two panes of glass separated by a dehydrated 1/2 inch airspace, filled with argon and hermetically sealed. Non-residential glazed systems (including frames and glass) shall be certified by the National Fenestration Rating Council with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of 0.24 determined according to NFRC 200 procedures and a U-factor maximum of 0.375 Btu/hr-ft2-F in accordance with NFRC 100. Glazing shall meet or exceed a luminous efficacy of 1.0. Glazed panels shall be rated for not less than 35 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413. Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be black, roll-formed, steel-reinforced butyl rubber or thermally broken aluminum, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate

moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

2.2.1 Buildings (all exterior glazing to be blast and hurricane resistant in accordance with ASCE 7-10, Sections 26.10.3.1&2)

1 Inch Insulated Glass with Laminated (Bonded) Construction: Two panes of glass separated by a 1/2 inch dehydrated airspace, filled with argon gas and hermetically sealed. Panes consist of two or more layers (plies) of chemically-strengthened float glass bonded together with polyvinyl butyral (PVB).

Insulated glass units shall have a Solar Heat Gain Coefficient (SHGC) maximum of 0.24 and a U-factor maximum of 0.375 Btu per square foot by hr by degree F.

Glazed panels shall be rated for not less than 35 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be black, roll-formed, steel-reinforced butyl rubber or thermally broken aluminum, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

Outer light shall be 1/4 inch nominal laminated glass: 1/8 inch clear chemically-strengthened glass, 0.090 inch polyvinyl butyral interlayer, 1/8 inch clear chemically-strengthened glass.

Inner light shall be 1/4 inch nominal laminated glass: 1/8 inch clear chemically-strengthened glass, 0.060 inch polyvinyl butyral interlayer, 1/8 inch clear chemically-strengthened glass.

2.2.2 Low Emissivity Insulating Glass

Interior and exterior glass panes for Low-E insulating units shall be Type I annealed flat glass, Class 1-clear with anti-reflective low-emissivity coating on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C1036. Glass performance shall be U value maximum of 0.375 Btu/hr-ft2-F, Solar Heat Gain Coefficient (SHGC) maximum of 0.24. Color shall be gray.

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted shall be gray or neutral color.

2.3.1 Putty and Glazing Compound

Glazing compound shall be as recommended by manufacturer for face-glazing metal sash. Putty shall be linseed oil type. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.3.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.3.3 Sealants

Provide elastomeric and structural sealants.

2.3.3.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant shall be white.

2.3.3.2 Structural Sealant

ASTM C1184, Type S.

2.3.4 Joint Backer

Joint backer shall have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.3.5 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

2.3.6 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes shall be chemically compatible with the product being set.

2.3.7 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (plus or minus 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer. Block color shall be black.

2.3.8 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths

or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as recommended by the manufacturer for the intended application.

2.3.8.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.3.8.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.3.8.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.9 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

PART 3 EXECUTION

3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation shall conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass shall be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass shall be clean at the time the work is accepted.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.5 WASTE MANAGEMENT

Disposal and recycling of waste materials, including corrugated cardboard recycling, shall be in accordance with the Waste Management Plan. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

-- End of Section --

SECTION 08 91 00

METAL WALL LOUVERS
05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500-D	(2012) Laboratory Methods of Testing Dampers for Rating
AMCA 511	(2013) Certified Ratings Program for Air Control Devices

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605	(2011) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2013) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall louvers

SD-03 Product Data

Metal Wall Louvers

SD-04 Samples

Wall louvers; G

Door louvers; G

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers shall be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

1.4 DETAIL DRAWINGS

Show all information necessary for fabrication and installation of wall louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

1.5 COLOR SAMPLES

Colors of finishes for wall louvers and door louvers shall closely approximate colors indicated. Where color is not indicated, submit the manufacturer's standard colors to the Contracting Officer for selection.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Galvanized Steel Sheet

ASTM A653/A653M, coating designation G90.

2.1.2 Aluminum Sheet

ASTM B209, alloy 3003 or 5005 with temper as required for forming.

2.1.3 Extruded Aluminum

ASTM B221, alloy 6063-T5 or -T52.

2.1.4 Stainless Steel

ASTM A167, Type 302 or 304, with 2B finish.

2.1.5 Cold Rolled Steel Sheet

ASTM A1008/A1008M, Class 1, with matte finish. Use for interior louvers only.

2.2 METAL WALL LOUVERS

Weather resistant type, with bird screens and made to withstand a wind load of not less than 45 pounds per square foot. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. The rating shall show a water penetration of 0.20 or less ounce per square foot of free area at a free velocity of 800 feet per minute.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch.

2.2.2 Formed Metal Louvers

Formed of stainless steel sheet not thinner than 16 U.S. gage, or aluminum sheet not less than 0.08 inch thick.

2.2.3 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions for all louvers more than 5 feet in width at not more than 5 feet on centers. Provide mullions covers on both faces of joints between louvers.

2.2.4 Screens and Frames

For aluminum louvers, provide 1/2 inch square mesh, 14 or 16 gage aluminum or 1/4 inch square mesh, 16 gage aluminum bird screening. For steel louvers, provide 1/2 inch square mesh, 12 or 16 gage zinc-coated steel; 1/2 inch square mesh, 16 gage copper; or 1/4 inch square mesh, 16 gage zinc-coated steel or copper bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Exposed aluminum surfaces shall be factory finished with an organic coating. Color to match exterior window framing as indicated.

2.4.1.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high-performance finish in accordance with AAMA 2605 with total dry film thickness of not less than 1.2 mil, color to match exterior window framing.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

-- End of Section --

SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M	(2010) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2014) Nonstructural Steel Framing Members
ASTM C754	(2011) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM C841	(2003; R 2013) Installation of Interior Lathing and Furring
ASTM C847	(2014a) Standard Specification for Metal Lath

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM EMLA 920	(2009) Guide Specifications for Metal Lathing and Furring

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2012) Fire Resistance Directory

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating.

2.1.1 Materials for Attachment of Lath

2.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, and ASTM C847.

2.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C645.

2.1.2.2 Nonload-Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0179 inch thickness, with 0.0329 inch minimum thickness supporting wall hung items such as cabinetwork, equipment and fixtures. The ASTM certified third party testing statement for equivalent thicknesses shall not apply.

2.1.2.3 Furring Structural Steel Columns

ASTM C645. Steel (furring) clips and support angles listed in UL Fire Resistance may be provided in lieu of steel studs for erection of gypsum wallboard around structural steel columns.

2.1.2.4 Z-Furring Channels with Wall Insulation

Not lighter than 26 gage galvanized steel, Z-shaped, with 1-1/4 inch and 3/4 inch flanges and depth as required by the insulation thickness provided.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Lath

3.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, except as indicated otherwise.

3.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2.2 Non-loadbearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.1.2.3 Furring Structural Steel Columns

Install studs or galvanized steel clips and support angles for erection of gypsum wallboard around structural steel columns in accordance with the UL Fire Resistance, design number(s) of the fire resistance rating indicated.

3.1.2.4 Z-Furring Channels with Wall Insulation

Install Z-furring channels vertically spaced not more than 24 inches o.c. Locate Z-furring channels at interior and exterior corners in accordance with manufacturer's printed erection instructions. Fasten furring channels to masonry and walls with powder-driven fasteners or hardened concrete steel nails through narrow flange of channel. Space fasteners not more than 24 inches o.c.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/4 inch in 8 feet from a straight line;

c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Provide framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/8 inch in 8 feet from a straight line;

c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 09 29 00

GYPSUM BOARD
05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C1002	(2014) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM C1047	(2014a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1178/C1178M	(2013) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
ASTM C1396/C1396M	(2014a) Standard Specification for Gypsum Board
ASTM C475/C475M	(2012; E 2014) Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C514	(2004; R 2014) Standard Specification for Nails for the Application of Gypsum Board
ASTM C840	(2013) Application and Finishing of Gypsum Board
ASTM C954	(2011) Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM D226/D226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish
GA 216	(2010) Application and Finishing of Gypsum Panel Products
GA 600	(2009) Fire Resistance Design Manual

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious backer units

Glass Mat Water-Resistant Gypsum Tile Backing Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

SD-07 Certificates

Asbestos Free Materials; G

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

SD-08 Manufacturer's Instructions

Material Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer maintenance instructions

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where

necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Gypsum wallboard shall not be stored with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

1.4.3 Temporary Ventilation

Provide temporary ventilation for work of this section.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.6 SCHEDULING

The gypsum wallboard shall be installed after the installation and ventilation period of the highly-emitting materials.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only. Submit Material Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

2.1.1 Gypsum Board

ASTM C1396/C1396M.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Glass Mat Water-Resistant Gypsum Tile Backing Board

ASTM C1178/C1178M.

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.3 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook.

2.1.4 Joint Treatment Materials

ASTM C475/C475M.

2.1.4.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.4.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.4.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.4.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.4.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.5 Fasteners

2.1.5.1 Nails

ASTM C514.

2.1.5.2 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.6 Adhesives

Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene. Adhesive shall contain a maximum VOC content of 50 grams per liter.

2.1.6.1 Adhesive for Fastening Gypsum Board to Metal Framing

Not permitted.

2.1.6.2 Adhesive for Laminating

Not permitted.

2.1.7 Shaftwall Liner Panel

ASTM C1396/C1396M. Conform to the UL Fire Resistance for the Design Numbers(s) indicated for shaftwall liner panels. Manufacture liner panel for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, 1 inch thick, by 24 inches wide.

2.1.8 Accessories

ASTM C1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.9 Asphalt Impregnated Building Felt

Provide a 15 lb asphalt moisture barrier over gypsum sheathing. Conforming to ASTM D226/D226M Type 1 (No. 15) for asphalt impregnated building felt.

2.1.10 Water

Provide clean, fresh, and potable water.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until

framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.1.2 Gypsum Board

Verify that surfaces of gypsum board to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.1.3 Masonry and Concrete Walls

Verify that surfaces of masonry and concrete walls to receive gypsum board applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive. Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Minimize framing by floating corners with single studs and drywall clips. Install 5/8 inch gypsum ceiling board over framing at 24 inches on center. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System V or GA 216.

3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.3 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board in accordance with ASTM C840, System X or GA 216.

3.2.4 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C1396/C1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Finish walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting to Level 3 in accordance with GA 214. Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with GA 214. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, or GA 600 for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings

tight in accordance with tested systems.

3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.8 SHAFTWALL FRAMING

Install the shaftwall system in accordance with the system manufacturer's published instructions. Coordinate bucks, anchors, blocking and other items placed in or behind shaftwall framing with electrical and mechanical work. Patch or replace fireproofing materials which are damaged or removed during shaftwall construction.

-- End of Section --

SECTION 09 30 13

CERAMIC TILING
11/13

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A137.1	(2012) American National Standards Specifications for Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C1026	(2013) Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling
ASTM C1027	(2009) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C207	(2006; R 2011) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C373	(2014a) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
ASTM C648	(2004; R 2009) Breaking Strength of Ceramic Tile
ASTM D226/D226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D4068	(2015) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (Bay Area AQMD)

Bay Area AQMD Rule 8-51	(1992; R 2001) Adhesive and Sealant Products

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2013) Handbook for Ceramic, Glass, and Stone Tile Installation

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BD+C	(2009; R 2010) Leadership in Energy and Environmental Design(tm) Building Design and Construction (LEED-NC)
LEED GBDC Ref Guide	(2009; R 2010) LEED Reference Guide for Green Building Design, Construction and Major Renovations of Commercial and Institutional Buildings including Core & Shell and K-12 Projects

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Tile; G

Setting-Bed; G

Mortar, Grout, and Adhesive; (LEED); G

Tile; (LEED BD+C)

SD-04 Samples

Tile; G

Accessories; G

Transition Strips; G

Grout; G

SD-07 Certificates

Tile

Mortar, Grout, and Adhesive

SD-08 Manufacturer's Instructions

Maintenance Instructions

SD-10 Operation and Maintenance Data

Installation; G

1.3 QUALITY ASSURANCE

Installers to be from a company specializing in performing this type of work and have a minimum of two years experience. Each type and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.4 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.7 EXTRA MATERIALS

Supply an extra 2 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Furnish tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 125 pounds for wall tile and 250 pounds for floor tile in accordance with ASTM C648. Provide exterior building tile for cold climate projects that is approved by the manufacturer for exterior use when tested in accordance with ASTM C1026. Provide floor tiles with a wet dynamic coefficient of friction (DCOF) value of 0.42 or greater when tested in accordance with ANSI A137.1 requirements. Provide glazed floor tile with a Class V-Heavy Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. Indicate VOC content. For materials like tile, accessories, and

transition strips, submit samples of sufficient size to show color range, pattern, type and joints. Submit manufacturer's catalog data.

2.1.1 Porcelain Tile

Furnish unglazed porcelain tile, and trim pieces with color extending uniformly through the body of the tile. Provide tile with a V3 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of 12 by 12 and 12 by 24 inch and 3/8 inch thick. Provide a 0.50 percent maximum water absorption in accordance with ASTM C373. See drawings for basis of design products.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.2 Hydrated Lime

Conform to ASTM C206 for hydrated lime, Type S or ASTM C207, Type S.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Submit certificates indicating conformance with specified requirements. Submit LEED documentation relative to low-emitting materials credit in accordance with LEED GBDC Ref Guide. Include in LEED Documentation Notebook. Interior adhesives, sealants, primers and sealants used as filler must meet the requirements of LEED low emitting materials credit. Submit manufacturer's catalog data. Conform to SCAQMD Rule 1168 and Bay Area AQMD Rule 8-51, and to the following for mortar, grout, adhesive, and sealant:

2.4.1 Latex-Portland Cement Mortar

TCNA Hdbk. Zero-VOC content.

2.4.2 Tile Grout

TCNA Hdbk; Epoxy Grout, stain-free and color uniformity. Maximum VOC content of 65 grams/liter. Provide grout joints per manufacturer's recommendation.

2.4.3 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Grout sealant must not change the color or alter the appearance of the grout.

2.4.4 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate over wood sub-floors, in accordance with TCNA Hdbk. Furnish 1/2 inch thick cementitious backer units.

2.5 TRANSITION STRIPS

Provide clear anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified.

2.6 TRIM

Provide Schluter style metal trim accessories for outside corners, cove base, and other conditions as as recommended by tile manufacturer.

2.7 MEMBRANE MATERIALS

Conform to ASTM D226/D226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D4068 4 mil for polyethylene film.

2.8 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture in accordance as indicated in drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide floor patterns as specified on the drawings.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCNA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 feet	1/8 inch in 10 feet
Organic Adhesives	1/8 inch in 8 feet	1/16 inch in 3 feet
Latex Portland Cement Mortar	1/8 inch in 8 feet	1/8 inch in 10 feet
Epoxy	1/8 inch in 8 feet	1/8 inch in 10 feet

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades

shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal Portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk, method W244C-11 and with grout joints as recommended by the manufacturer for the type of tile.

3.3.1 Latex-Portland Cement Mortar

Use Latex-Portland Cement to install tile in accordance with TCNA Hdbk. Use Latex-Portland Cement when installing porcelain ceramic tile.

3.3.2 Organic Adhesive

Conform to TCNA Hdbk for the organic adhesive installation of ceramic tile.

3.3.3 Tile Grout

Prepare and install tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standard product for sealing grout joints in accordance with manufacturer's recommendations.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk method F112 and with grout joints as recommended by the manufacturer for the type of tile.

3.4.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to TCNA Hdbk for workable mortar bed materials and installation. Conform to TCNA Hdbk for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.4.2 Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCNA Hdbk. Use Latex -Portland cement when installing porcelain ceramic tile.

3.4.3 Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standard product for sealing grout joints

in accordance with manufacturer's recommendations.

3.4.4 Waterproofing

Shower pans are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. Conform to the requirements of Section 07 12 00 BUILT-UP BITUMINOUS WATERPROOFING for waterproofing under concrete fill.

3.4.5 Concrete Fill

Provide a 3,500 psi concrete fill mix to dry as consistency as practicable. Spread, tamp, and screed concrete fill to a true plane, and pitch to drains or levels as shown. Thoroughly damp concrete fill before applying setting-bed material. Reinforce concrete fill with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped a minimum 2 inches. Tie laps together with 18 gauge wire every 10 inches along the finished edges and every 6 inches along the cut ends and edges. Provide reinforcement with support and secure in the centers of concrete fills. Provide a continuous mesh; except where expansion joints occur, cut mesh and discontinue across such joints. Provide reinforced concrete fill under the setting-bed where the distance between the under-floor surface and the finished tiles floor surface is a minimum of 2 inches, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCNA Hdbk method.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Install thresholds where indicated, in a manner similar to that of the ceramic tile floor and as recommended by the manufacturer. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.6.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.6.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 24 to 36 feet each way in large interior floor areas and 12 to 16 feet each way in large exterior areas or areas exposed to direct sunlight or moisture. Extend expansion joints through setting-beds and fill.

3.7 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout

manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles. Submit copy of manufacturer's printed maintenance instructions.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2013) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B633	(2013) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2013a) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C834	(2014) Latex Sealants
ASTM E1264	(2014) Acoustical Ceiling Products
ASTM E1414/E1414M	(2011a; E 2014) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998a; R 2013) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

ASTM E580/E580M	(2014) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E795	(2005; R 2012) Mounting Test Specimens During Sound Absorption Tests

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2013) Seismic Design for Buildings

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. The unit size, texture, finish, and color must be as specified. The Contractor has the option to substitute inch-pound (I-P) Recessed Light Fixtures (RLF) for metric RLF. If the Contractor opts to furnish I-P RLF, other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills, shall also be I-P products. Coordinate the whole ceiling system with other details, like the location of access panels and ceiling penetrations, etc., shown on the drawings. The Contractor is responsible for all associated labor and materials and for the final assembly and performance of the specified work and products if I-P products are used. The location and extent of acoustical treatment shall be as shown on the approved detail drawings. Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

1.2.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) of 35 when determined in accordance with ASTM E1414/E1414M. Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions as required to achieve the specified CAC. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

1.2.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423 Test Method.

1.2.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 Test Method.

1.2.4 Other Submittals Requirements

The following shall be submitted:

a. Manufacturer's data indicating percentage of recycle material in acoustic ceiling tiles to verify affirmative procurement compliance.

b. Total weight and volume quantities of acoustic ceiling tiles with recycled material.

c. Manufacturer's catalog showing UL classification of fire-rated ceilings giving materials, construction details, types of floor and roof constructions to be protected, and UL design number and fire protection time rating for each required floor or roof construction and acoustic ceiling assembly.

d. Reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified fire endurance and sound transmission requirements. Data attesting to conformance of the proposed system to Underwriters Laboratories requirements for the fire endurance rating listed in UL Fire Resistance may be submitted in lieu of test reports.

e. Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings

SD-03 Product Data

Acoustical Ceiling Systems

Certification

SD-04 Samples

Acoustical Units

Acoustic Ceiling Tiles

SD-06 Test Reports

Fire Resistive Ceilings

Ceiling Attenuation Class and Test

SD-07 Certificates

Acoustical Units

Acoustic Ceiling Tiles

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to ensure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period. Include an agreement to repair or replace acoustical panels that fail within the warranty period in the standard performance guarantee or warranty. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

1.8 EXTRA MATERIALS

Furnish spare tiles, from the same lot as those installed, of each color at the rate of 5 tiles for each 1,000 tiles installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Submit two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to ASTM E1264, Class A, and the following requirements:

2.1.1 Affirmative Procurement

Mineral Wool, Cellulose, and Laminated Paperboard used in acoustic ceiling tiles are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/). EPA's recommended Recovered Materials Content Levels for Mineral Wool, Cellulose, Structural Fiberboard and Laminated Paperboard are:

Product	Material	Percent of Post Consumer Materials	Percent of Total Recovered Materials
Laminate Paperboard	Post Consumer Paper	100	100
Rock Wool	Slag	75	
Cellulose	Post Consumer Paper	75	75

a. The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.

b. Submit recycled material content data for acoustic ceiling tiles indicating compliance with affirmative procurement.

c. Submit total weight and volume quantities of acoustic ceiling tiles with recycle material.

2.1.2 Units for Exposed-Grid System ACT-1

2.1.2.1 Type

IV (non-asbestos mineral fiber with membrane-faced overlay).

2.1.2.2 Flame Spread

Class A, 25 or less.

2.1.2.3 Pattern

E.

2.1.2.4 Minimum NRC

0.75 in open office areas; 0.60 in conference rooms, executive offices, teleconferencing rooms, and other rooms as designated; 0.50 in all other rooms and areas when tested on mounting Type E-400 of ASTM E795.

2.1.2.5 Minimum Light Reflectance Coefficient

LR-1, 0.75 or greater.

2.1.2.6 Nominal Size

24 by 24 inches.

2.1.2.7 Edge Detail

Reveal.

2.1.2.8 Finish

Factory-applied standard finish.

2.1.2.9 Minimum CAC

35.

2.2 SUSPENSION SYSTEM

Provide standardexposed-grid as shown on drawings suspension system conforming to ASTM C635/C635M for heavy-duty systems. Provide surfaces exposed to view of aluminum or steel with a factory-applied white baked-enamel finish. Provide wall molding having a flange of not less than 15/16 inch. Provide inside and outside corner caps. Suspended ceiling framing system must have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Provide a suspension system with a maximum deflection of 1/360 of the span length. Conform seismic details to the guidance in UFC 3-310-04 and ASTM E580/E580M.

2.3 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gage).

2.3.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.3.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.3.4 Masonry Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices for machine screws.

2.4 ADHESIVE

Use adhesive as recommended by tile manufacturer.

2.5 FINISHES

As indicated in drawings.

2.6 COLORS AND PATTERNS

Use colors and patterns for acoustical units and suspension system components as indicated in drawings.

2.7 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining.

PART 3 EXECUTION

3.1 INSTALLATION

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and

execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inches from each corner of each fixture.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 3 inches from ends of each length and not more than 16 inches on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Caulking

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.1.5 Adhesive Application

Wipe back of tile to remove accumulated dust. Daub acoustical units on back side with four equal daubs of adhesive. Apply daubs near corners of tiles. Ensure that contact area of each daub is at least 2 inches diameter in final position. Press units into place, aligning joints and abutting units tight and uniform without differences in joint widths.

3.2 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

3.3 RECLAMATION PROCEDURES

Neatly stack ceiling tile, designated for recycling by the Contracting Officer, on 4 by 4 foot pallets not higher than 4 foot. Panels must be completely dry. Shrink wrap and symmetrically stack pallets on top of each other without falling over.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4078	(2002; R 2008) Water Emulsion Floor Polish
ASTM E648	(2014c) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F1344	(2015) Rubber Floor Tile
ASTM F1482	(2004; E 2009; R 2009) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1700	(2013a) Solid Vinyl Floor Tile
ASTM F1861	(2008; E 2012; R 2012) Resilient Wall Base
ASTM F1869	(2011) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2169	(2014) Resilient Stair Treads
ASTM F2170	(2011) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
ASTM F710	(2011) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 253	(2011) Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

1.2 SYSTEM DESCRIPTION

1.2.1 Fire Resistance Requirements

Provide a critical radiant flux of not less than 0.45 watts per square centimeter (Class 1) flooring in corridors and exits when tested in accordance with ASTM E648 or NFPA 253.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G

Adhesives

Rubber Tile Flooring
Solid Vinyl Tile

Wall Base

SD-04 Samples

Resilient Flooring and Accessories; G

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G

SD-08 Manufacturer's Instructions

Surface Preparation; G

Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store exposed rubber surface materials in occupied spaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.8 EXTRA MATERIALS

Provide extra flooring material of each color and pattern at the rate of 5 square feet for each 1,000 square feet of sheet flooring installed. Provide extra wall base material composed of 20 linear feet of each type, color and pattern. Package all extra materials in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Provide extra materials from the same lot as those installed. Leave extra stock at the site in location assigned by Contracting Officer.

PART 2 PRODUCTS

2.1 RUBBER TILE

Conform to ASTM F1344 Class 1 homogeneous Type A (solid color), 12 inch square. Provide hammered surface studs with chamfered edges. Provide low stud profile. Provide 0.125 inch overall thickness.

2.2 SOLID VINYL TILE

Conform to ASTM F1700 Class III printed film minimum wear layer thickness 0.020 inch and minimum overall thickness 0.125 inch, Type B (embossed). Provide 4 inch wide by 36 inch long plank. Tick surface texture and square edge.

2.3 WALL BASE

Conform to ASTM F1861, Type TP (thermoplastic rubber) Style B (coved - installed with resilient flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color.

2.4 STAIR TREADS, RISERS AND STRINGERS

Conform to ASTM F2169, Type TP (thermoplastic rubber). Conform to ASTM F2169 for surface of treads hammered. Provide square nosing. Provide either a one piece nosing/tread/riser or a two piece nosing/tread design with a matching coved riser.

2.5 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. VOC content shall be less than 50 grams/L. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.6 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with ASTM F1482 for panel type underlayment products. Use one of the following substrates:

a. Concrete.

2.7 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D4078 for polish.

2.8 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.9 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories as indicated on the drawings. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inches. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as

recommended by the flooring manufacturer. Comply with ASTM F710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 PLACING SOLID VINYL TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.5 PLACING RUBBER TILE

Install rubber tile and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Provide square, symmetrical, tight, and even flooring lines and joints. Keep each floor in true, level plane, except where slope is indicated. Vary width of edge tiles as necessary to maintain full-size tiles, except where irregular-shaped rooms makes it impossible. Cut flooring to fit around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe flooring to walls and partitions after field flooring has been applied.

3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline.

Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions.

3.7 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.8 PLACING STAIR TREADS, RISERS, AND STRINGERS

Secure and install stair treads, risers, and stringers in accordance with manufacturer's printed installation instructions. Cover the surface of treads and risers the full width of the stairs. Provide equal length pieces butted together to cover the treads and risers for stairs wider than manufacturer's standard lengths. Provide stringer angles on both the wall and banister sides of the stairs, and landing trim.

3.9 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry/clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer's written instructions.

3.10 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS
05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2001; Supplements 2002-2008) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235	(2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D4263	(1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2013) Use and Calibration of Hand-Held Moisture Meters
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D6386	(2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM F1869	(2011) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 1	(Oct 2009) Aluminum Paint
MPI 101	(Oct 2009) Epoxy Anti-Corrosive Metal Primer
MPI 107	(Oct 2009) Rust Inhibitive Primer (Water-Based)
MPI 108	(Oct 2009) High Build Epoxy Coating, Low Gloss

MPI 11	(Oct 2009) Exterior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 116	(Oct 2009) Epoxy Block Filler
MPI 138	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 2
MPI 141	(Oct 2009) Interior High Performance Latex MPI Gloss Level 5
MPI 144	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 2
MPI 145	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 3
MPI 153	(Oct 2009) Interior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 163	(Oct 2009) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 31	(Oct 2009) Polyurethane, Moisture Cured, Clear Gloss
MPI 39	(Oct 2009) Interior Latex-Based Wood Primer
MPI 4	(Oct 2009) Interior/Exterior Latex Block Filler
MPI 45	(Oct 2009) Interior Alkyd Primer Sealer
MPI 47	(Oct 2009) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 48	(Oct 2009) Interior Alkyd, Gloss, MPI Gloss Level 6
MPI 50	(Oct 2009) Interior Latex Primer Sealer
MPI 60	(Oct 2009) Interior/Exterior Latex Floor Paint, Low Gloss
MPI 77	(Oct 2009) Epoxy Gloss
MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer
MPI 94	(Oct 2009) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 95	(Oct 2009) Quick Drying Primer for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SP-01	(2000) Environmentally Preferable Product Specification for Architectural and

Anti-Corrosive Paints

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application
SSPC QP 1	(2012; E 2012) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
SSPC SP 1	(1982; E 2004) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC SP 12/NACE No.5	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP 2	(1982; E 2000; E 2004) Hand Tool Cleaning
SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC VIS 4/NACE VIS 7	(1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 24	(2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(2014; Rev E) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to

	Government Activities
FED-STD-595	(Rev C; Notice 1) Colors Used in Government Procurement

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS SP-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-02 Shop Drawings

Piping identification
Submit color stencil codes

SD-03 Product Data

Certification
Environmental Data
Materials

Coating; G
Manufacturer's Technical Data Sheets
Indicate VOC content.
Sealant

SD-04 Samples

Color; G

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-07 Certificates

Applicator's qualifications
Qualification Testing laboratory for coatings; G

SD-08 Manufacturer's Instructions

Application instructions
Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings; G

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

a. Name of individual and proposed position for this work.

b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.3.2 SSPC QP 1 Certification

All contractors and subcontractors that perform surface preparation or coating application shall be certified by the Society for Protective Coatings (formerly Steel Structures Painting Council) (SSPC) to the requirements of SSPC QP 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting contractors and painting subcontractors must remain so certified for the duration of the project. If a contractor's or subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in contractor certification status.

1.4 QUALITY ASSURANCE

1.4.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph "Sampling Procedures." Test each chosen product as specified in the paragraph "Testing Procedure." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be at no cost to the Government.

1.4.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor shall provide one quart samples of the selected paint materials. The samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

1.4.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. The qualification testing lab report shall include the backup data and summary of the test results. The summary shall list all of the reference specification requirements and the result of each test. The summary shall clearly indicate whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If the Contractor chooses MPI to perform the Batch

Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

1.5 REGULATORY REQUIREMENTS

1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.4 Asbestos Content

Materials shall not contain asbestos.

1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.5.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.5.7 Human Carcinogens

Materials shall not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F. Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to adsorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.

1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance

with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.

b. 29 CFR 1910.1000.

c. ACGIH 0100, threshold limit values.

1.8 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 5 degrees F above dew point;

b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.8.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

a. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.

b. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.9 SUSTAINABLE DESIGN REQUIREMENTS

1.9.1 Environmental Data

Submit Table 1 of ASTM E2129 for products.

1.10 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

1.11 COLOR SELECTION

Color Coding For Shore-To-Ship Utility Connections: Paint hose connection fittings and shut-off valves the designated color. In addition to color coding provide 2 inch high stenciled letters using black stencil paint, clearly designating service for each connection.

Color Coding for Shore-to-Ship Utility Connections		
Service	Color	FED-STD-595 No.
Potable Water*	Blue	15044
Water Provided for Fire Protection**	Red	11105
Chilled Water	Striped Blue/White	15044/17886
Oily Waste Water	Striped Yellow/Black	13538/17038
Sewer	Gold	17043
Steam	White	17886
High Pressure Air	Gray	16081
Low Pressure Air	Tan	10324
Fuel	Yellow	13655
* This includes connections serving domestic functions.		
** This includes non-potable salt water or, at some locations, fresh water connections provided for fire protection (may also include flushing and cooling requirements). Note: This does not include waterfront fire hydrants.		

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Color, texture, and pattern of wall coating systems shall be as indicated.

1.12 LOCATION AND SURFACE TYPE TO BE PAINTED

1.12.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.

b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.

c. Existing coated surfaces that are damaged during performance of the work.

1.12.1.1 Exterior Painting

Includes new surfaces of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.12.1.2 Interior Painting

Includes new surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

a. Exposed columns, girders, beams, joists, and metal deck; and

b. Other contiguous surfaces.

1.12.2 Painting Excluded

Do not paint the following unless indicated otherwise.

a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.

b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.

c. Steel to be embedded in concrete.

d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.

e. Hardware, fittings, and other factory finished items.

1.12.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.

   1. Exposed piping, conduit, and ductwork;

   2. Supports, hangers, air grilles, and registers;

   3. Miscellaneous metalwork and insulation coverings.

1.12.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material. In lieu of red enamel finish coat, provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals.

b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

1.12.4 Exterior Painting of Site Work Items

All exposed items unless indicated otherwise or factory coated.

1.12.5 Definitions and Abbreviations

1.12.5.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.12.5.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.12.5.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.12.5.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.12.5.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.12.5.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.12.5.7 EXT

MPI short term designation for an exterior coating system.

1.12.5.8 INT

MPI short term designation for an interior coating system.

1.12.5.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.12.5.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.12.5.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.12.5.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		
Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).			

1.12.5.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.12.5.14 Paint

See Coating definition.

1.12.5.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.12.5.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents. Minimum 20 percent post-consumer recycled content for the light-colored paints and primers. Minimum 50 percent post-consumer recycled content for the dark-colored paints and primers. All consolidated latex paints shall contain a minimum of 100 percent post-consumer recycled content. Comply with applicable regulations regarding toxic and hazardous materials.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6/NACE No.3, or SSPC SP 10/NACE No. 2. Brush-off blast remaining surface in accordance with SSPC 7/NACE No.4. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/NACE No.3/SSPC SP 12/NACE No.5 WJ-3.

c. Metal Floor Surfaces to Receive Nonslip Coating: Clean in accordance with SSPC SP 10/NACE No. 2.

3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 3.

For abrasive blast cleaned surfaces, the requirements are stated in SSPC 7/NACE No.4, SSPC SP 6/NACE No.3, and SSPC SP 10/NACE No. 2. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 1.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12/NACE No.5. As a visual reference, cleaned surfaces shall be

similar to photographs in SSPC VIS 4/NACE VIS 7.

3.3.3 Galvanized Surfaces

a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized". If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.

3.3.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

Surface Cleaning: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.3.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

a. Curing: Concrete, stucco and masonry surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

1. Dirt, Chalking, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.

2. Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

3. Paint and Loose Particles: Remove by wire brushing.

4. Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and

minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

a. Surface Cleaning: Plaster and stucco shall be clean and free from loose matter; gypsum board shall be dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.

b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D4263. New plaster to be coated shall have a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.5.1 New Uncoated Plywood and Wood Surfaces, Except Floors:

a. Wood surfaces shall be cleaned of foreign matter.

Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood.

b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces (2/3 cup) trisodium phosphate, 1 ounce (1/3 cup) household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

c. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter in accordance with ASTM D4444, Method A, unless otherwise authorized.

d. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints.

e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.

f. Cosmetic Repair of Minor Defects:

1. Knots and Resinous Wood: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.

2. Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.

3. Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

3.5.2 Wood Floor Surfaces, Natural Finish

a. Initial Surface Cleaning: As specified in paragraph entitled "Surface Preparation."

b. Sanding and Scraping: Sanding of wood floors is specified in Section 09 64 66 WOOD ATHLETIC FLOORING. Floors of oak or similar open-grain wood shall be filled with wood filler recommended by the finish manufacturer and the excess filler removed.

c. Final Cleaning: After sanding, sweep and vacuum floors clean. Do not walk on floors thereafter until specified sealer has been applied and is dry.

3.5.3 Interior Wood Surfaces, Stain Finish

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

3.6 APPLICATION

3.6.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners,

crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. For piping in finished areas, provide prime surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.

c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

e. Floors: For nonslip surfacing on level floors, as the intermediate coat is applied, cover wet surface completely with almandite garnet, Grit No. 36, with maximum passing U.S. Standard Sieve No. 40 less than 0.5 percent. When the coating is dry, use a soft bristle broom to sweep up excess grit, which may be reused, and vacuum up remaining residue before application of the topcoat. For nonslip surfacing on ramps, provide MPI 77 with non-skid additive, applied by roller in accordance with manufacturer's instructions.

3.6.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.6.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.6.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table	
Division 3	Exterior Concrete Paint Table
Division 4	Exterior Concrete Masonry Units Paint Table
Division 5	Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
Division 9	Exterior Stucco Paint Table
Division 10	Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table
Division 3	Interior Concrete Paint Table
Division 4	Interior Concrete Masonry Units Paint Table
Division 5	Interior Metal, Ferrous and Non-Ferrous Paint Table
Division 6	Interior Wood Paint Table
Division 9	Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes,

enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.

c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.

d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:

1. One coat of primer.

2. One coat of undercoat or intermediate coat.

3. One topcoat to match adjacent surfaces.

e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.

b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.

c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.

d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.

e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.9 COATING SYSTEMS FOR WOOD AND PLYWOOD

a. Apply coatings of Tables in Division 6 for Exterior and Interior.

b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.

c. Apply stains in accordance with manufacturer's printed instructions.

d. Wood Floors to Receive Natural Finish: Thin first coat 2 to 1 using thinner recommended by coating manufacturer. Apply all coatings at rate of 300 to 350 square feet per gallon. Apply second coat not less than 2 hours and not over 24 hours after first coat has been applied. Apply with lambs wool applicators or roller as recommended by coating manufacturer. Buff or lightly sand between intermediate coats as recommended by coating manufacturer's printed instructions.

3.10 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.11 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.12 PAINT TABLES

All DFTs are minimum values. Use only materials with a GPS green check mark having a minimum MPI "Environmentally Friendly" E3 rating based on VOC (EPA Method 24) content levels. Use only interior paints and coatings that meet VOC requirements of LEED low emitting materials credit. Acceptable products are listed in the MPI Green Approved Products List, available at http://www.specifygreen.com/APL/ProductIdxByMPInum.asp.

3.12.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:

1. Latex
New; MPI EXT 3.1A-G5 (Semigloss) / Existing; MPI EXT 3.1A-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 11	MPI 11	MPI 11

System DFT: 3.5 mils

Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New concrete masonry on uncoated surface:

1. Latex
New; MPI EXT 4.2A-G5 (Semigloss) / Existing; MPI REX 4.2A-G5 (Semigloss)

Block Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 11	MPI 11

System DFT: 11 mils

Topcoat: Coating to match adjacent surfaces.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

A. New steel blast cleaned to SSPC SP 10/NACE No. 2:

1. Waterborne Light Industrial
MPI EXT 5.1R-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 101	MPI 108	MPI 163

System DFT: 8.5 mils

EXTERIOR GALVANIZED SURFACES

B. New Galvanized surfaces:

1. Epoxy Primer / Waterborne Light Industrial Coating
MPI EXT 5.3K-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 101	MPI 163	MPI 163

System DFT: 5 mils

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

C. Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment. Match surrounding finish:

1. Alkyd
MPI EXT 5.4F-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 94	MPI 94

System DFT: 5 mils

3.12.2 INTERIOR PAINT TABLES

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New Concrete masonry:

1. Institutional Low Odor / Low VOC Latex
New; MPI INT 4.2E-G2 (Flat)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 144	MPI 144

System DFT: 4 mils

B. New Concrete masonry units in toilets,

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation and other high humidity areas unless otherwise specified:

1. Epoxy

MPI INT 4.2G-G6 (Gloss)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 116	N/A	MPI 77	MPI 77

System DFT: 10 mils

Fill all holes in masonry surface

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, surfaces adjacent to painted surfaces (Match surrounding finish), exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. High Performance Architectural Latex

MPI INT 5.1R-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 138	MPI 138

System DFT: 5 mils

MPI INT 5.1R-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 141	MPI 141

System DFT: 5 mils

B. Metal in toilets, food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation, and other high-humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. Alkyd

MPI INT 5.1E-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 47	MPI 47

System DFT: 5.25 mils

C. Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces as follows:

1. Aluminum Paint

MPI INT 5.1M

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 1	MPI 1

System DFT: 4.25 mils

D. Miscellaneous non-ferrous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

INTERIOR STEEL / FERROUS SURFACES

1. High Performance Architectural Latex
   MPI INT 5.4F-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 138	MPI 138

   System DFT: 5 mils

2. Alkyd
   MPI INT 5.4J-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 48	MPI 48

   System DFT: 5 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New Wood and plywood not otherwise specified:

1. High Performance Architectural Latex
   MPI INT 6.4S-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 141	MPI 141

   System DFT: 4.5 mils

B. New Wood Floors; Natural finish or stained:

1. Natural finish, Moisture Cured Polyurethane
   New; MPI INT 6.5K-G6 (Gloss) / Existing; MPI RIN 6.5D-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 31	MPI 31	MPI 31

   System DFT: 4 mils

C. New Wood floors; pigmented finish:

1. Latex Floor Paint
   New; MPI INT 6.5G-G2 (Flat) / Existing; MPI RIN 6.5J-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 60	MPI 60

   System DFT: 4.5 mils

D. New wood surfaces in toilets, food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation and other high humidity areas not otherwise specified.

1. Waterborne Light Industrial
   MPI INT 6.3P-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 153	MPI 153

   System DFT: 4.5 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New Wallboard not otherwise specified:

1. High Performance Architectural Latex - High Traffic Areas
   New; MPI INT 9.2B-G2 (Flat) / Existing; MPI RIN 9.2B-G2 (Flat)

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 138	MPI 138

System DFT: 4 mils

2. Institutional Low Odor / Low VOC Latex

New; MPI INT 9.2M-G2 (Flat) / Existing; MPI RIN 9.2M-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 144	MPI 144

System DFT: 4 mils

New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 145	MPI 145

System DFT: 4 mils

B. New Wallboard in toilets, food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation and other high humidity areas not otherwise specified.:

1. Waterborne Light Industrial Coating

New; MPI INT 9.2L-G5(Semigloss) / Existing; MPI RIN 9.2L-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 153	MPI 153

System DFT: 4 mils

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE
11/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2009) Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015; ERTA 2015) Life Safety Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Installation; G

Warranty; G

SD-04 Samples

Interior Signage; G

Software; G

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions; G

Protection and Cleaning; G

1.3 EXTRA MATERIALS

Provide 5 extra frames and extra stock of the following: blank plates of each color and size for sign types M.1B.CC, M.7B.CC, M.25.CC and equipment necessary for removal of signage parts and pieces.

1.4 QUALITY ASSURANCE

1.4.1 Samples

Submit interior signage samples of each sign type showing typical quality, workmanship and color: Directional sign, Standard Room sign, Changeable message strip sign. The samples may be installed in the work, provided each sample is identified and location recorded.

1.4.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials shall be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product shall be delivered to the job site in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Warrant the interior signage for a period of 2 years against defective workmanship and material. Warranties shall be signed by the authorized representative of the manufacturer. Submit warranty accompanied by the document authenticating the signer as an authorized representative of the guarantor. Guarantee that the signage products and the installation are free from any defects in material and workmanship from the date of delivery.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Signs, plaques, directories, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening. Obtain signage from a single manufacturer with edges and corners of finished letterforms and graphics true and clean.

2.2 ROOM IDENTIFICATION/DIRECTIONAL SIGNAGE SYSTEM

2.2.1 Standard Room Signs

Signs shall consist of 6063-T5 extruded aluminum in accordance with ASTM B209 and shall conform to the following:

a. Frames shall be aluminum.

b. End caps shall be aluminum with square style corners.

See attachment for detailed sign information.

2.2.2 Type of Mounting for Signs

Provide extruded aluminum brackets for hanging, projecting, and double-sided signs. Mounting for framed, hanging, and projecting signs shall be by mechanical fasteners. Surface mounted signs shall be mounted with 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive shall be transparent, long aging, high tech formulation on two sides of the vinyl foam fabricated from materials that are not corrosive to sign material and mounting surface.

2.3 STAIR SIGNAGE

Provide signs on stairs serving three or more stories with special signage within the enclosure at each floor landing conforming to NFPA 101. Indicate the floor level, the terminus of the top and bottom of the stair enclosure, and the identification of the stair enclosure. Also, state the floor level of, and the direction to, exit discharge. Locate the signage inside the enclosure in a position that is visible when the door is in the open or closed position and install in conformance with 36 CFR 1191. The floor level designation shall also be tactile in accordance with ICC A117.1.

2.4 BUILDING DIRECTORIES

Building directories shall be lobby directories or floor directories, and shall be provided with a changeable directory listing consisting of the areas, offices and personnel located within the facility. Dimensions, details, and materials of sign and message content shall be as shown on the drawings.

2.4.1 Header Panel

Header panel shall be shown in drawings and attachment.

2.5 FABRICATION AND MANUFACTURE

2.5.1 Factory Workmanship

Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

2.5.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.6 COLOR, FINISH, AND CONTRAST

Color shall be as indicated on drawings. Finish of all signs shall be eggshell, matte, or other non-glare finish as required in handicapped-accessible buildings.

2.7 TYPEFACE

ADA-ABA compliant font for Room Signs.

PART 3 EXECUTION

3.1 INSTALLATION

Signs shall be installed plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings and attachments. Submit six copies of operating instructions outlining the step-by-step procedures required for system operation. The instructions shall include simplified diagrams for the system as installed, the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS," name and location of the facility, name of the Contractor, and contract number. Mounting height and mounting location shall conform to 36 CFR 1191. Required blocking shall be installed. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces shall be installed with matching blank back-up plates in accordance with manufacturer's instructions.

3.1.1 Anchorage

Anchorage shall be in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or shown shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

a. Signs mounted to painted gypsum board surfaces shall be removable for painting maintenance.

b. Mount signs mounted to lay-in ceiling grids with clip connections to ceiling tees.

c. Install signs mounted on metal surfaces with magnetic tape.

d. Install signs mounted on fabric surfaces with hook and loop tape or pin mount.

3.1.2 Protection and Cleaning

Protect the work against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned at completion of sign installation in accordance with the manufacturer's approved instructions

and the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA, Package 1. Submit six copies of maintenance instructions listing routine procedures, repairs, and guides.

-- End of Section --

SECTION 10 26 00

WALL AND DOOR PROTECTION
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D256	(2010) Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D543	(2014) Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D635	(2014) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015) Determining Resistance of Synthetic Polymeric Materials to Fungi

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1545	(2005; R 2014) Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Corner Guards; G
Wall Guards (Bumper Guards); G

SD-03 Product Data

Corner Guards; G
Wall Guards (Bumper Guards); G

SD-04 Samples

Finish; G

SD-06 Test Reports

Corner Guards
Wall Guards (Bumper Guards)

SD-07 Certificates

Corner Guards
Wall Guards (Bumper Guards)

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Keep materials dry, protected from weather and damage, and stored under cover. Materials shall be stored at approximately 70 degrees F for at least 48 hours prior to installation.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

To the maximum extent possible, corner guards, door and door frame protectors, wall guards (bumper guards), wall panels and wall covering shall be the standard products of a single manufacturer and shall be furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown will be acceptable.

2.1.1 Resilient Material

Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:

2.1.1.1 Minimum Impact Resistance

Minimum impact resistance shall be 18 ft-lbs/sq. inch when tested in accordance with ASTM D256, (Izod impact, ft-lbs per sq inch notched).

2.1.1.2 Fire Rating

Fire rating shall be Class 1 when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material shall be rated self extinguishing when tested in

accordance with ASTM D635. Material shall be labeled and tested by an approved nationally known testing laboratory. Resilient material used for protection on fire rated doors and frames shall be listed by the testing laboratory performing the tests. Resilient material installed on fire rated wood/steel door and frame assemblies shall have been tested on similar type assemblies. Test results of material tested on any other combination of door/frame assembly will not be acceptable.

2.1.1.3 Integral Color

Colored components shall have integral color and shall be matched in accordance with SAE J1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.1.1.4 Chemical and Stain Resistance

Materials shall be resistant to chemicals and stains reagents in accordance with ASTM D543.

2.1.1.5 Fungal and Bacterial Resistance

Materials shall be resistant to fungi and bacteria in accordance with ASTM G21, as applicable.

2.2 CORNER GUARDS

2.2.1 Resilient Corner Guards

Corner guard units shall be surface mounted type, radius formed to profile shown. Corner guards shall be 48 inches from top of wall base. Mounting hardware, cushions, and base plates shall be furnished. Assembly shall consist of a snap-on corner guard formed from high impact resistant resilient material, mounted on a continuous aluminum retainer. Extruded aluminum retainer shall conform to ASTM B221, alloy 6063, temper T5 or T6. Factory fabricated end closure caps shall be furnished for top and bottom of surface mounted corner guards. Insulating materials that are an integral part of the corner guard system shall be provided by the manufacturer of the corner guard system. Exposed metal portions of fire rated assemblies shall have a paintable surface.

2.3 WALL GUARDS (BUMPER GUARDS)

2.3.1 Wall Guards

Wall guards, shall be provided with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories standard with the manufacturer. Extruded aluminum retainers shall conform to ASTM B221, alloy 6063, temper T5 or T6. End caps and corners shall be field adjustable to assure close alignment with wall guards. Wall guards shall have profile as shown.

2.3.2 Wall Guards

Wall guards shall consist of snap-on covers of high impact resistant resilient material, minimum 0.078 inch thick, mounted over 2 inch wide aluminum, minimum 0.062 inch thick retainer, anchored to wall at maximum 24 inches on center.

2.4 TRIM, FASTENERS AND ANCHORS

Provide trim, fasteners and anchors for each specific installation as shown.

2.5 FINISH

Submit three samples indicating color and texture of materials requiring color and finish.

2.5.1 Resilient Material Finish

Finish for resilient material shall be embossed velour and fake woodgrain texture with colors in accordance with SAE J1545.

2.6 ADHESIVES

Adhesive for resilient material shall be in accordance with manufacturers recommendations.

2.7 COLOR

Color shall be as indicated in drawings.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Corner Guards and Wall Guards

Material shall be mounted at location indicated in accordance with manufacturer's recommendations.

3.1.2 Corner Guards

a. Mount guards on external corners of interior walls, partitions and columns as in accordance with manufacturer's recommendations.

b. Where corner guards are installed on gypsum board, clean surfaces and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from the guard edges and allow to cure undisturbed for 24 hours.

-- End of Section --

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES
02/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D2047	(2011) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
ASTM E648	(2014c) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

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SD-02 Shop Drawings

Installation Drawings; G

Detail Drawings; G

SD-03 Product Data

Entrance Floor Mats and Frames; G

SD-04 Samples

Entrance Floor Mats and Frames; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G

SD-10 Operation and Maintenance Data

Protection, Maintenance, and Repair Information; G

1.3 QUALITY ASSURANCE

Comply with 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines for installed entrance floor mats and frames. Ensure entrance floor mats and frames are slip resistant in accordance with ASTM D2047, Coefficient of Friction, minimum 0.60 for accessible routes and be structurally capable of withstanding a wheel load of 350 lb./wheel. Ensure flammability is in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.

1.4 DELIVERY OF MATERIALS

Deliver materials to the project site in their original packages or containers bearing labels clearly identifying the manufacturer, brand name, and quality or grade.

Store materials in their original unbroken packages or containers in the area in which they will be installed. Unwrap, inspect, and place mats at indicated location. Remove all excess packing materials.

PART 2 PRODUCTS

2.1 Entrance Floor Mats and Frames

Submit manufacturer's catalog data. Submit sample of assembled sections of floor mat showing corners, intersections, and other details of construction. Submit samples of exposed floor mat, frame finish and accessories, and custom graphics.

2.1.1 Floor Grids

Floor grid consists of a series of aluminum tread rails spaced 1.5 inch on center and running counter to the traffic flow. Ensure floor grids allow debris to fall to sub-floor. Drain pan is required. Rest grid assemblies on continuous vinyl cushion mounted to each continuous foot. Provide all anchors, fasteners, accessories and other necessary parts required for a complete installation.

2.1.2 Frames

Surface mounted frames are tapered mill finish not less than 2 inches wide, screwed to the floor to create an opening for the mat to set in. Edge-frame members are fabricated in single lengths or minimum pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins. Ensure concealed surfaces of aluminum frames that contact cementitious material are coated with manufacturer's standard protective coating. Frames include accessories and devices necessary for a complete installation.

2.1.3 Tread Insert Options

Tread inserts consist of rubber. A flexible EPDM tread insert.

2.2 COLOR AND SIZE

Ensure color is in accordance with the drawings. Size of mat is as

indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Comply with manufacturer's requirements of substrates and floor conditions affecting installation of floor mats and frames. Installation cannot occur until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install floor mats and frames according to manufacturer's instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action. Coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

Submit detail drawings, and custom graphics drawings as required. Provide installation drawings. Provide manufacturer's protection, maintenance, and repair information.

-- End of Section --

SECTION 21 13 13.00 20

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2013) Laminated Thermosetting Materials

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2016) Standard for the Installation of Sprinkler Systems
NFPA 25	(2014) Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2006; Change 3, 2013) Fire Protection Engineering for Facilities

1.2 SYSTEM DESCRIPTION

Design and modify existing automatic wet pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout the renovation area as indicated on the Contract Drawings.

Work includes the addition and relocation of sprinklers to accommodate the renovated areas, the addition of floor control valve assemblies, and the addition of a backflow preventer at the building water entrance location.

Work also includes demo of existing retard chamber, pressure switch, exterior water motor alarm, and associated trim, and installing new vane-type water flow switch.

1.3 SPRINKLER SYSTEM DESIGN

Except as modified herein, design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions

of NFPA 13, including all recommendations and advisory portions, which shall be considered mandatory; this includes advisory provisions listed in the appendices of such standard(s), as though the word "shall" had been substituted for the word "should" wherever it appears. Design system by hydraulic calculations for uniform distribution of water over the design area. Hydraulic calculations shall assume a 12 psi pressure loss for the backflow preventer assembly. Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Provide sprinklers and piping system layout. All Devices and equipment for fire protection service shall be UL Fire Prot Dir listed or FM APP GUIDE approved for use in wet pipe sprinkler systems.

1.3.1 Location of Sprinklers

Sprinklers in relation to the ceiling and the spacing of sprinklers shall not exceed that permitted by NFPA 13 for the hazards indicated on the contract drawings. Sprinklers shall provide coverage throughout 100 percent of the renovation area.

1.3.2 Density of Application of Water

Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be as indicated on the contract drawings.

1.3.3 Sprinkler Discharge Area

Any required increases from NFPA 13 shall be applied to an initial hydraulically most remote area of size as indicated on the contract drawings. Area reductions from NFPA 13 shall not be applied to this area.

1.3.4 Outside Hose Allowances

Hydraulic calculations shall include a hose allowance for outside hose streams as indicated on the contract drawings.

1.3.5 Water Supply

Base hydraulic calculations on the water supply data from the Contractor's required flow test.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval.

Partial submittals and submittals not fully complying with the requirements and recommended practices of NFPA 13 and this specification section shall be returned disapproved without review. This contract stipulation is non-negotiable.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

Prepare 24 by 36 inch detail working drawings of sprinklers and piping. Floor plans shall be drawn to a scale not less than 1/8 inch = 1 foot-0 inches. Show data essential for proper installation of each system. Show details, plan view, elevations and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe and fittings. Show point to point electrical wiring diagrams. Submit drawings signed by the Sprinkler System Designer. Provide three copies of the Sprinkler System Shop Drawings, no later than 21 days prior to the start of sprinkler system installation.

SD-03 Product Data

Pipe; G
Fittings; G
Valves, including gate, check, and globe; G
Sprinklers; G
Pipe hangers and supports; G
Sprinkler Alarm Switches; G
Mechanical couplings; G
Backflow Prevention Assembly; G

Annotate descriptive data to show the specific model, type, and size of each item. Catalog cuts shall also indicate UL Listing/FM Approval and country of manufacture.

SD-05 Design Data

Hydraulic Calculations; G

Submit computer program generated hydraulic calculations to substantiate compliance with hydraulic design requirements. Calculations shall be performed by computer using software intended specifically for fire protection system design.

SD-06 Test Reports

Request to schedule Preliminary Tests; G
Preliminary Test Report; G

Three copies of the completed Preliminary Test Report, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Sprinkler System Designer.

Request to schedule Final Acceptance Test; G
Final Acceptance Test Report; G

Three copies of the completed Final Acceptance Tests Reports, no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Sprinkler System Designer.

SD-07 Certificates

Inspection by Sprinkler System Designer; G

Concurrent with the Final Acceptance Test Report, certification by the Sprinkler System Designer that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports.

Sprinkler System Designer; G

The name and documentation of certification of the proposed Sprinkler System Designer, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations.

Sprinkler System Installer; G

Submit data showing the Sprinkler System Installer has successfully installed systems of the same type and design as specified herein, Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months. Provide NICET certification of the system technician. Contractor shall submit data along with submittal of the Sprinkler System Designer Qualifications.

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA as supplemented and modifies by this specification section.

Provide six manuals in accordance with NFPA 13. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Manuals shall include copies of NFPA 25, as required by NFPA 13. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis.

SD-11 Closeout Submittals

As-built drawings; G

As-built shop drawings, at no later than 14 days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed. Provide electronic drawings in dwg or pdf format.

On-site training; G

1.5 QUALIFICATIONS

1.5.1 Sprinkler System Designer

The Sprinkler System Designer shall either be a Fire Protection Engineer who is a registered professional engineer (P.E.) that has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a NICET Level III technician in Water-Based Systems Layout.

1.5.2 Sprinkler System Installer

The Sprinkler System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Installation drawings, shop drawings and as-built drawings shall be prepared, by or under the supervision of, an system technician who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level III certification in Water-Based Systems Layout or by a fire protection engineer.

1.6 QUALITY ASSURANCE

1.6.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.6.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.6.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.6.4 Field Fabricated Nameplates

Comply with ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the

position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.7 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.8 DELIVERY, STORAGE AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

PART 2 PRODUCTS

2.1 ABOVEGROUND PIPING COMPONENTS

All components of the aboveground piping shall fully comply with the requirements and recommended practices of NFPA 13 and this specification section. Aboveground piping shall be steel.

2.1.1 Steel Pipe

Pipe shall be rigid black steel. Steel piping shall be Schedule 40. Fittings into which sprinklers, sprinkler riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be permitted. Mechanical tees are allowed where connecting to existing sprinkler piping. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 40 shall not be threaded.

2.1.2 Grooved Mechanical Joints and Fittings

Grooved couplings, fittings and grooving tools shall be products of the same manufacturer.

2.1.3 Flexible Sprinkler Hose

The use of flexible sprinkler hose is not permissible.

2.1.4 Sprinklers

Provide nominal 0.50 inch or 0.53 inch orifice sprinklers, except where residential sprinklers are indicated. Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Provide sprinklers as indicated on the contract drawings. Sprinklers in high heat areas shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers

shall not be used. Provide sprinkler guards as indicated on the contract drawings. Deflector shall not be more than 3 inches below suspended ceilings. Ceiling plates shall not be more than 0.5 inch deep. Ceiling cups shall not be permitted.

2.1.5 Valves

Provide valves of types approved for fire service. Valves shall open by counterclockwise rotation. Check valves shall be clear opening swing-check type with inspection and access cover plate for sizes 8 inches and larger. Each control valve shall be electrically supervised; minimum contact ratings shall be 2.5 amps at 24 volts DC. Provide supervision against valve closure or tampering of valve.

2.1.6 Pipe Supports

Provide Pipe hangers and supports in accordance with NFPA 13.

2.1.7 Backflow Prevention Assembly

Provide listed double check valve assembly backflow preventer. Each check valve shall have a drain. Backflow prevention assemblies shall have current "Certificate of Approval from the Foundation for Cross-Connection Control and Hydraulic Research, FCCCHR List. Listing of the specific make, model, design, and size in the FCCCHR List shall be acceptable as the required documentation." The maximum pressure loss shall be 12 psi at a flow rate equal to the sprinkler water demand, per UFC 3-600-01.

2.2 ALARM INITIATING AND SUPERVISORY DEVICES

2.2.1 Sprinkler Alarm Switches

Provide vane type flow switch(es) with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Connection of switch shall be under Section 28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM. Vane type Alarm actuating devices shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle. Flow switches for elevator power shunt shall have no retard feature. Provide properly lettered and approved metal sign to elevator flow switch stating the circuits' voltage, and identify the switch as an "Elevator Power Shunt Flow Switch."

2.2.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.3 ACCESSORIES

2.3.1 Sprinkler Cabinet

Provide metal cabinet with extra sprinklers and sprinkler wrench in sprinkler riser room. The number and types of extra sprinklers shall be as specified in NFPA 13.

2.3.2 Pipe Escutcheon

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.4 BACKFLOW PREVENTER FLOW TEST CONNECTION

Provide test connection for forward flow testing of the backflow preventer at maximum sprinkler system demand. Provide flush style connection with a minimum of two 2-1/2 inch threaded male outlets with cap and chain, 3 inch inlet, and matching wall plate indicating "Backflow Preventer Test Connection."

PART 3 EXECUTION

3.1 INSPECTION BY SPRINKLER SYSTEM DESIGNER

The Sprinkler System Designer shall inspect the sprinkler system periodically during the installation to assure the sprinkler system is being provided and installed in accordance with the contract requirements and the approved sprinkler system submittal(s). The Sprinkler System Designer shall attend both the preliminary and final tests, and shall sign the test results. After the preliminary testing has been completed, the Sprinkler System Designer, shall certify in writing the system is ready for the final inspections and tests. This report shall document any discrepancies found and what actions will be taken to correct. Any discrepancy noted during the periodic site visits or the preliminary testing shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

3.2 ABOVEGROUND PIPING INSTALLATION

The methods of fabrication and installation of the aboveground piping shall fully comply with the requirements and recommended practices of NFPA 13 and this specification section.

3.2.1 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.2.2 Pendent Sprinklers

Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 1 inch below the underside of the ceiling. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grids.

3.2.3 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing

fittings. Bushings are prohibited.

3.2.4 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.2.5 Inspector's Test Connection

Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device. Provide test connection piping to a drain location that can accept full flow where the discharge will be readily visible and where water may be discharged without property damage. Discharge to floor drains, janitor sinks or similar fixtures shall not be permitted. Provide discharge orifice of same size as corresponding sprinkler orifice. The penetration of the exterior wall shall be no greater than 2 feet above finished grade.

3.2.6 Backflow Preventer Test Connection

Connection shall be mounted on the exterior wall at the same height as the Fire Department Connection. Connection shall discharge at a safe point outside the building.

3.2.7 Drains

Main drains piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13.

3.2.8 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Valve identification signs shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.3 ELECTRICAL WORK

Except as supplemented and modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM.

3.4 PIPE PAINTING AND COLOR CODE MARKING

Paint and color code mark sprinkler piping system as specified in Section 09 90 00 PAINTS AND COATINGS.

3.5 PRELIMINARY TESTS

The aboveground piping and system components shall be tested to assure that equipment and components function as intended. The aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13. Submit request to schedule Preliminary Tests, no later than 14 days prior to the proposed start of the tests. Upon completion of specified tests, the Contractor shall submit for approval a Preliminary Test Report.

3.5.1 Aboveground Piping

3.5.1.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13.

3.5.1.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop shall be compared to the manufacturer's data and the readings observed during the final inspections and tests.

3.6 FINAL ACCEPTANCE TEST

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. Submit request to schedule Final Acceptance Test, no later than 14 days prior to the proposed start of the tests. Notification shall include a copy of the Contractor's Material & Test Certificates.

An experienced technician regularly employed by the system installer shall be present during the inspection. The Sprinkler System Designer shall attend the final inspections and tests. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, electricity, instruments, connecting devices, and personnel for the tests. The Government will furnish water for the tests. The Mid-Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer will witness formal tests and approve systems before they are accepted.

3.7 ON-SITE TRAINING

Submit request to schedule the On-site Training, at least 14 days prior to the start of related training but prior to the final inspections and tests.

The sprinkler contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 4 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The On-Site Training shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 1010	(2002) Self-Contained, Mechanically Refrigerated Drinking-Water Coolers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z124.1.2	(2005) Plastic Bathtub and Shower Units
ANSI Z21.22/CSA 4.4	(2015) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 189.1	(2014; Errata 1-2 2015) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - IP	(2013; INT 1 2013; Errata 1-3 2013; Errata 4-6 2014; Errata 7-8 2015; INT 2-3 2015) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003	(2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)
ASSE 1010	(2004) Performance Requirements for Water Hammer Arresters (ANSI approved 2004)
ASSE 1018	(2001) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084	(2005) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(2010; Addenda 2011) Hypochlorites

AWWA B301	(2010) Liquid Chlorine
AWWA C203	(2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C606	(2015) Grooved and Shouldered Joints
AWWA C651	(2014) Standard for Disinfecting Water Mains
AWWA C652	(2011) Disinfection of Water-Storage Facilities

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding

ASME INTERNATIONAL (ASME)

ASME A112.14.1	(2003; R 2012) Backwater Valves
ASME A112.19.2/CSA B45.1	(2013) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.3/CSA B45.4	(2008; R 2013) Stainless Steel Plumbing Fixtures
ASME A112.36.2M	(1991; R 2012) Cleanouts
ASME A112.6.1M	(1997; R 2012) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2001; R 2007) Standard for Floor and Trench Drains
ASME B1.20.1	(2013) Pipe Threads, General Purpose (Inch)
ASME B16.12	(2009; R 2014) Cast Iron Threaded Drainage Fittings
ASME B16.15	(2013) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.34	(2013) Valves - Flanged, Threaded and Welding End

ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B31.5	(2013) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2010) BPVC Section IV-Rules for Construction of Heating Boilers
ASME CSD-1	(2012) Control and Safety Devices for Automatically Fired Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M	(2014) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2015) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A515/A515M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A74	(2013a) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2013a) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B370	(2012) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B813	(2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper

	and Copper Alloy Tube
ASTM B828	(2002; R 2010) Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
ASTM B88	(2014) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2013) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM C564	(2014) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D2000	(2012) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2822/D2822M	(2005; E 2011; R 2011) Asphalt Roof Cement
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers
ASTM F1760	(2001; R 2011) Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
ASTM F2389	(2010) Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
ASTM F477	(2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2009) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(2011) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015	(2010) Copper Tube Handbook

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2009) Accessible and Usable Buildings and Facilities
ICC IPC	(2012) International Plumbing Code

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-110	(2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
MSS SP-25	(2013) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-67	(2011) Butterfly Valves
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2011; Errata 2013) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-78	(2011) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(2013) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF 372	(2011) Drinking Water System Components - Lead Content
NSF/ANSI 14	(2014) Plastics Piping System Components and Related Materials
NSF/ANSI 61	(2014a; ERTA 1-2 2015) Drinking Water System Components - Health Effects

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA Fire Man	(2010) Firestopping: Plastic Pipe in Fire Resistive Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201	(2010) Water Hammer Arresters Standard

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508	(2009) Hose Clamp Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

PL 93-523	(1974; A 1999) Safe Drinking Water Act

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 141.80	National Primary Drinking Water Regulations; Control of Lead and Copper; General Requirements
PL 109-58	Energy Policy Act of 2005 (EPAct05)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System; G

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Fixtures

List of installed fixtures with manufacturer, model, and flow rate.

Flush Tank Water Closets

Countertop Lavatories

Kitchen Sinks

Service Sinks

Drinking-Water Coolers; G

Shower Base

Pumps; G

Shower Faucets; G

Welding

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Plumbing System

Diagrams, instructions, and other sheets proposed for posting. Manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe.

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts

Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

SD-10 Operation and Maintenance Data

Plumbing System; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening.

Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." R eferences to the "owner" shall be interpreted to mean the "Contracting Officer."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1 shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ICC IPC. Energy consuming products and systems shall be in accordance with PL 109-58 and ASHRAE 90.1 - IP.

1.6 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Water-Efficient Products

Provide documentation that the following products meet water efficiency requirements as outlined in this section and when applicable, that they

are EPA WaterSense labeled products:

a. Fixtures.

b. Flush tank water closets.

c. Wall-hung lavatories.

d. Countertop lavatories.

e. Kitchen sinks.

f. Service sinks.

g. Drinking-water coolers.

h. Pumps.

i. Showerheads.

2.2 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. PVC pipe shall contain a minimum of 25 percent recycled content in accordance with ASTM F1760. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size and shall comply with NSF/ANSI 14, NSF/ANSI 61 and ASTM F2389. Polypropylene piping that will be exposed to UV light shall be provided with a Factory applied UV resistant coating. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61, Annex G or NSF 372. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF/ANSI 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.2.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used underground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

a. Coupling for Cast-Iron Pipe: For hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310.

b. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.

c. Brazing Material: Brazing material shall conform to AWS A5.8/A5.8M, BCuP-5.

d. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: Lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.

e. Solder Material: Solder metal shall conform to ASTM B32.

f. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.

g. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.

h. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.

i. Rubber Gaskets for Grooved Pipe: ASTM D2000, maximum temperature 230 degrees F.

j. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.

k. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A183.

l. Flanged fittings including, but not limited to, flanges, bolts, nuts and bolt patterns shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A105/A105M. Blind flange material shall conform to ASTM A516/A516M cold service and ASTM A515/A515M for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A193/A193M.

m. Copper tubing shall conform to ASTM B88, Type K or L.

2.2.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

a. Water Hammer Arrester: PDI WH 201. Water hammer arrester shall be diaphragm type.

b. Copper, Sheet and Strip for Building Construction: ASTM B370.

c. Asphalt Roof Cement: ASTM D2822/D2822M.

d. Hose Clamps: SAE J1508.

e. Supports for Off-the-Floor Plumbing Fixtures: ASME A112.6.1M.

f. Metallic Cleanouts: ASME A112.36.2M.

g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.

h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.

i. Hypochlorites: AWWA B300.

j. Liquid Chlorine: AWWA B301.

k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.

l. Thermometers: ASTM E1. Mercury shall not be used in thermometers.

2.2.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.3 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58.

2.4 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110

Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810: Requirements for Potable-Water Heaters Bottom Drain Valve
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4
Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers	ASME CSD-1 Safety Code No., Part CW, Article 5

2.4.1 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh shall have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of heat input is greater than 200,000 Btuh shall have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

2.4.2 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough

or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

2.5 FIXTURES

Fixtures shall be water conservation type, in accordance with ASHRAE 189.1 Section 6.3.2.1 (Plumbing fixtures and Fittings). Fixtures for use by the physically handicapped shall be in accordance with ICC A117.1. ASME A112.19.3/CSA B45.4 302 stainless steel or vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush valves, shower mixing valves, shower head face plates, and pop-up stoppers of lavatory waste drainsshall be copper alloy.

2.5.1 Flush Tank Water Closets (WC-1, WC-2)

ASME A112.19.2/CSA B45.1, white vitreous china, siphon jet, round bowl, pressure assisted, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Nonfloat swing type flush tank valves are not acceptable. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet shall not exceed 1.28 gallons per flush. Tank-type water closets must meet the specifications of http://www.epa.gov/watersense/partners/product_program_specs.html and must be EPA WaterSense labeled products. Provide white solid plastic round closed-front seat with cover.

2.5.2 Wall Hung Lavatories (L-3)

ASME A112.19.2/CSA B45.1, white vitreous china, straight back type, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide aerator with faucet. Water flow rate shall not exceed 0.5 gpm when measured at a flowing water pressure of 60 psi. Faucet shall be single-handle, AOA approved, oil rubbed bronze or equivalent color finish. Lavatory faucets and lavatory faucet accessories must meet the EPA WaterSense product definition specified in http://www.epa.gov/watersense/partners/product_program_specs.html and must be EPA WaterSense labeled products. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 34 inches above floor and

with 29 inches minimum clearance from bottom of the front rim to floor. Provide top mounted washerless centerset lavatory faucets.

Provide ASSE 1070 point of use mixing valve at each faucet, set temp shall be 105 degrees F.

2.5.3 Undercounter Lavatories (L-1, L-2)

ASME A112.19.2/CSA B45.1, white vitreous china, under-mount, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with undercounter mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Provide aerator with faucet. Water flow rate shall not exceed 1.5 gpm when measured at a flowing water pressure of 60 psi. Lavatory faucets and lavatory faucet accessories must meet the EPA WaterSense product definition specified in http://www.epa.gov/watersense/partners/product_program_specs.html and must be EPA WaterSense labeled products. Provide top mounted washerless centerset lavatory faucets. Faucet shall be single-handed, ADA approved, with oil-rubbed bronze or equivalent color finish.

Provide ASSE 1070 point of use mixing valve at each faucet, set point shall be 105 degrees F.

2.5.4 Kitchen Sinks (S-1)

ASME A112.19.3/CSA B45.4, 20 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 12 inches wide by 10 inches front to rear, two compartments, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets with hose spray, and with 3.5 inch drain outlet. Provide aerator with faucet. Water flow rate shall not exceed 1.5 gpm when measured at a flowing water pressure of 60 psi. Provide stainless steel drain outlets and stainless steel cup strainers. Provide separate 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Provide top mounted washerless sink faucets, on 4 inch center, goose neck spout with wrist blade turn handles. Provide ASSE 1070 point of use missing valve at faucet, set point shall be 110 degrees F..

2.5.5 Service Sinks (S-2)

Single compartment, multi-purpose polypropylene composite floor-mounted sink. Sink is to be minimum 20 inches wide, 24 inches deep, with depth of 13 inches. Sink is to be provided with P-trap. Provide chrome-plated faucet complete with vacuum breaker, integral stops, adjustable wall brace, pail hook, four-arm hot and cold handles with 3/4 inch spout.

2.5.6 Bi-Level Wheelchair Drinking Water Cooler (ECW-1)

AHRI 1010, bi-level wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 8 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 27 inch minimum knee clearance from front bottom of unit to floor and 36 inch maximum spout height above floor and bottle filler. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.5.7 Shower Faucets and Drain Fittings (SH-1, SH-2)

Provide single control pressure equalizing shower faucets with body

mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide shower heads which deliver a maximum of 2.0 gpm per ASHRAE 189.1 Section 6.3.2.1 (Plumbing Fixtures and Fittings) requirements. Showerheads must meet the EPA WaterSense product definition specified in http://www.epa.gov/watersense/partners/product_program_specs.html and must be EPA WaterSense labeled products. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub diverter spouts. Provide separate globe valves or angle valves with union connections in each supply to faucet. Shower faucet shall be ASSE 1016 certified. Provide 30 inch guide rail, stainless steel hose and hand held shower head for ADA showers. Provide 1.5 inch copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required. Shower head and control lever shall have oil-rubbed bronze or equivalent color finish.

2.5.8 Plastic Shower Stalls and Base (SH-1, SH-2)

CSA B45.11-11/IAPMO Z124-2011, three piece, white or off-white solid acrylic pressure molded fiberglass reinforced plastic shower stalls. Shower shall shall be scratch resistant, waterproof, and reinforced. Shower stall shall have an embossed large title pattern on back and side panels. Provide recessed type shower stalls approximately 60 inches wide, 30 inches front to rear, 76 inches high. Shower stall shall meet performance requirements of CSA B45.11-11/IAPMO Z124-2011 and shall be labeled by NAHB Research Foundation, Inc. for compliance. Install shower stall in accordance with accordance with the manufacturer's written instructions. Finish installation by covering shall stall attachment flanges with dry-wall in accordance with shower stall manufacturer's recommendation. Provide smooth 100 percent, silicone rubber bathtub caulk between the top, side and bottom of the shower stalls and bathroom walls and floors; color shall match shower stall. Shower base shall be reinforced solid surface, with slip-resistant surface, white or off-white in color; color shall match shower stall. Shower base shall conform to ANSI Z124.1.2. Provide floor outlet copper alloy body drain cast integral within surface, with polished stainless-steel strainer. Provide ADA approved shower base, grab bars and seat where indicated on drawings.

2.5.9 Washer Utility Box (WUB)

Washer utility box shall have brass quarter turn valves with integral water hammer arresters. Waste drain shall be integrated within box. Unit shall be metal powder coated box.

2.5.10 Ice Maker Box (IMB)

Ice maker box shall have quarter turn valve. Unit shall be metal powder coated box.

2.6 DRAINS

2.6.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall

have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to ASME A112.6.3.

2.6.1.1 Drains and Backwater Valves

Drains and backwater valves installed in connection with waterproofed floors or shower pans shall be equipped with bolted-type device to securely clamp flashing.

2.7 TRAPS

Unless otherwise specified, traps shall be copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be without a cleanout. Provide traps with removable access panels for easy clean-out at sinks and lavatories. Tubes shall be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.8 MISCELLANEOUS PIPING ITEMS

2.8.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

2.8.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where penetrating a membrane waterproof floor.

2.8.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry

and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.8.2.2 Sleeves not in Masonry and Concrete

Provide 26 gage galvanized steel sheet.

2.8.3 Pipe Hangers (Supports)

Provide MSS SP-58 Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.8.4 Nameplates

Provide 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gauges, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 0.25 inch high normal block lettering into the white core. Minimum size of nameplates shall be 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA Fire Man. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting

of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and full port ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets and changes in direction where indicated and required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If

mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.1.7 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Mechanical Couplings

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Grooved fittings and couplings, and grooving tools shall be provided from the same manufacturer. Segmentally welded elbows shall not be used. Grooves shall be prepared in accordance with the coupling manufacturer's latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls,

ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

3.1.2.4 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.5 Copper Tube and Pipe

a. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.

b. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with ICC IPC.

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic.

Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant. Pipe sleeves in fire-rated walls shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

3.1.4.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.4.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

a. A standard roof coupling for threaded pipe up to 6 inches in diameter.

b. A tack-welded or banded-metal rain shield around the pipe.

3.1.4.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs FLASHING REQUIREMENTS and WATERPROOFING, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.4.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.5 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided as specified in Section 07 84 00 FIRESTOPPING.

3.1.6 Supports

3.1.6.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical

movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.6.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 except as modified herein.

a. Types 5, 12, and 26 shall not be used.

b. Type 3 shall not be used on insulated pipe.

c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.

d. Type 19 and 23 C-clamps shall be torqued per MSS SP-58 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.

h. Type 40 shields shall:

    1. Be used on insulated pipe less than 4 inches.

    2. Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.

    3. Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.

i. Horizontal pipe supports shall be spaced as specified in MSS SP-58 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.

j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.

k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating

temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

1. On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

2. On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

3. On pipe 4 inches and larger carrying medium less that 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

l. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.

m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.

n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.6.3 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.7 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or

stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron.

3.2 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided on water closets and sink faucets. Lavatory faucets, shower head, and lever handle shall be oil rubber bronze or equivalent. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.2.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.2.2 Height of Fixture Rims above Floor

Wall-mounted lavatories shall be mounted with rim 31 inches above finished floor. Under-counter lavatories shall be installed in vanity. Wall-hung drinking fountains and water coolers shall be installed with rim 42 inches above floor. Wall-hung service sinks shall be mounted with rim 28 inches above the floor. Installation of fixtures for use by the physically handicapped shall be in accordance with ICC A117.1.

3.2.3 Shower Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

3.2.4 Fixture Supports

Fixture supports for off-the-floor lavatories, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a

foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.2.4.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

3.2.4.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

3.2.4.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.2.5 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with ICC IPC at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.2.6 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.2.7 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type.

3.2.8 Shower Base

Before installing shower base subfloor shall be free of projections such as nail heads or rough edges of aggregate. Drain shall be a bolt-down, clamping-ring type with weepholes, installed so the lip of the subdrain is flush with subfloor.

3.3 IDENTIFICATION SYSTEMS

3.3.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.3.2 Pipe Color Code Marking

Color code marking of piping shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.3.3 Color Coding Scheme for Locating Hidden Utility Components

Scheme shall be provided in buildings having suspended grid ceilings. The color coding scheme shall identify points of access for maintenance and operation of operable components which are not visible from the finished space and installed in the space directly above the suspended grid ceiling. The operable components shall include valves, dampers, switches, linkages and thermostats. The color coding scheme shall consist of a color code board and colored metal disks. Each colored metal disk shall be approximately 3/8 inch in diameter and secured to removable ceiling panels with fasteners. The fasteners shall be inserted into the ceiling panels so that the fasteners will be concealed from view. The fasteners shall be manually removable without tools and shall not separate from the ceiling panels when panels are dropped from ceiling height. Installation of colored metal disks shall follow completion of the finished surface on which the disks are to be fastened. The color code board shall have the approximate dimensions of 3 foot width, 30 inches height, and 1/2 inch thickness. The board shall be made of wood fiberboard and framed under glass or 1/16 inch transparent plastic cover. Unless otherwise directed, the color code symbols shall be approximately 3/4 inch in diameter and the related lettering in 1/2 inch high capital letters. The color code board shall be mounted and located in the mechanical or equipment room. The color code system shall be as indicated below:

Color	System	Item	Location
_____	_____	_____	_____

3.4 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish,

corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.5 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

3.5.1 Painting of New Equipment

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.5.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B117, and for that test the acceptance criteria shall be as follows: Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.5.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

3.6 TESTS, FLUSHING AND DISINFECTION

3.6.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with ICC IPC, except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure and reasons for choosing this option in lieu of the smoke test to the Contracting Officer for approval.

a. Drainage and Vent Systems Test. The final test shall include a smoke test.

b. Building Sewers Tests.

c. Water Supply Systems Tests.

3.6.1.1 Shower Base

After installation of the pan and finished floor, the drain shall be temporarily plugged below the weep holes. The floor area shall be flooded with water to a minimum depth of 1 inch for a period of 24 hours. Any drop in the water level during test, except for evaporation, will be reason for rejection, repair, and retest.

3.6.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.6.3 System Flushing

3.6.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water

fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.6.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements. Unless more stringent local requirements exist, lead levels shall not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

3.6.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

a. Time, date, and duration of test.

b. Water pressures at the most remote and the highest fixtures.

c. Operation of each fixture and fixture trim.

d. Operation of each valve, hydrant, and faucet.

e. Temperature of each domestic hot-water supply.

f. Operation of each floor drain by flooding with water.

g. Operation of each vacuum breaker and backflow preventer.

3.6.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.

a. Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material shall be hypochlorites or liquid chlorine. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm).

Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

b. Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet shall be opened and closed several times.

c. After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

d. Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet shall be opened and closed several times.

e. Take addition samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA 10084. The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.

f. Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.7 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.8 TABLES

TABLE I

PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X		X	
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A888. Pipe and fittings shall be marked with the CISPI trademark.		X		X
3	Cast iron drainage fittings, threaded, ASME B16.12		X		X
4	Cast iron screwed fittings (threaded) ASME B16.4		X		X

SERVICE:
A - Underground Building Soil, Waste and Storm Drain
B - Aboveground Soil, Waste, Drain In Buildings
C - Underground Vent
D - Aboveground Vent

* - Hard Temper

TABLE II					
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS					
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D
1	Seamless copper water tube, ASTM B88, ASTM B88M	X**	X**	X**	X***
2	Cast bronze threaded fittings, ASME B16.15 for use with	X	X		X
3	Wrought copper and bronze solder-joint pressure fittings,	X	X	X	X
4	Cast copper alloy solder-joint pressure fittings,	X	X	X	X
5	Fittings: brass or bronze; ASME B16.15, and ASME B16.18	X	X		
	SERVICE: A - Cold Water Service Aboveground B - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground Indicated types are minimum wall thicknesses. ** - Type L - Hard *** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors **** - In or under slab floors only brazed joints				

-- End of Section --

SECTION 23 00 00

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500-D	(2012) Laboratory Methods of Testing Dampers for Rating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 62.1	(2010; Errata 2011; INT 3 2012; INT 4 2012; INT 5 2013) Ventilation for Acceptable Indoor Air Quality
ASHRAE 70	(2006; R 2011) Method of Testing for Rating the Performance of Air Outlets and Inlets
ASHRAE 90.1 - IP	(2013; INT 1 2013; Errata 1-3 2013; Errata 4-6 2014; Errata 7-8 2015; INT 2-3 2015) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASME INTERNATIONAL (ASME)

ASME A13.1	(2007; R 2013) Scheme for the Identification of Piping Systems

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B766	(1986; R 2015) Standard Specification for Electrodeposited Coatings of Cadmium
ASTM C553	(2013) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM E2016	(2011) Standard Specification for Industrial Woven Wire Cloth

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2014) Motors and Generators
NEMA MG 10	(2013) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1819	(2002) Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 5th Edition
SMACNA 1966	(2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

U.S. DEPARTMENT OF ENERGY (DOE)

PL-109-58	(1992; R 2005) Energy Efficient Procurement Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 82	Protection of Stratospheric Ozone

UNDERWRITERS LABORATORIES (UL)

UL 181	(2013) Factory-Made Air Ducts and Air Connectors
UL 555	(2006; Reprint May 2014) Standard for Fire Dampers
UL 6	(2007; Reprint Nov 2014) Electrical Rigid

	Metal Conduit-Steel
UL Bld Mat Dir	(2012) Building Materials Directory
UL Electrical Constructn	(2012) Electrical Construction Equipment Directory
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

Furnish ductwork, piping offsets, fittings, and accessories as required to provide a complete installation. Coordinate the work of the different trades to avoid interference between piping, equipment, structural, and electrical work. Provide complete, in place, all necessary offsets in piping and ductwork, and all fittings, and other components, required to install the work as indicated and specified.

1.2.1 Mechanical Equipment Identification

The number of charts and diagrams shall be equal to or greater than the number of mechanical equipment rooms. Where more than one chart or diagram per space is required, mount these in edge pivoted, swinging leaf, extruded aluminum frame holders which open to 170 degrees.

1.2.1.1 Charts

Provide chart listing of equipment by designation numbers and capacities such as flow rates, pressure and temperature differences, heating and cooling capacities, horsepower, pipe sizes, and voltage and current characteristics.

1.2.1.2 Diagrams

Submit proposed diagrams, at least 2 weeks prior to start of related testing. provide neat mechanical drawings provided with extruded aluminum frame under 1/8-inch glass or laminated plastic, system diagrams that show the layout of equipment, piping, and ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system. After approval, post these items where directed.

1.2.2 Service Labeling

Label equipment, including fans, air handlers, terminal units, etc., with labels made of self-sticking, plastic film designed for permanent installation. Labels shall be in accordance with the typical examples below:

SERVICE	LABEL AND TAG DESIGNATION
Dedicated Outdoor Air handling unit Number	DOAS - 1
Packaged Terminal Heat Pump Number	PTHP - 1

SERVICE	LABEL AND TAG DESIGNATION
Cabinet Unit Heater	CUH - 1
Unit Heater	UH-1

Identify similar services with different temperatures or pressures. Where pressures could exceed 125 pounds per square inch, gage, include the maximum system pressure in the label. Label and arrow piping in accordance with the following:

a. Each point of entry and exit of pipe passing through walls.

b. Each change in direction, i.e., elbows, tees.

c. In congested or hidden areas and at all access panels at each point required to clarify service or indicated hazard.

d. In long straight runs, locate labels at distances within eyesight of each other not to exceed 75 feet. All labels shall be visible and legible from the primary service and operating area.

For Bare or Insulated Pipes	
for Outside Diameters of	Lettering
1/2 thru 1-3/8 inch	1/2 inch
1-1/2 thru 2-3/8 inch	3/4 inch
2-1/2 inch and larger	1-1/4 inch

1.2.3 Color Coding

Color coding of all piping systems shall be in accordance with ASME A13.1.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only.

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Metallic Flexible Duct

Insulated Nonmetallic Flexible Duct Runouts

Duct Connectors

Duct Access Doors; G

Fire Dampers; G

Manual Balancing Dampers; G

Diffusers

Registers

Louvers

Residential Kitchen Exhaust Hood

Sidewall Vent

SD-06 Test Reports

Performance Tests; G

Damper Acceptance Test; G

SD-07 Certificates

Bolts

Certification

Ozone Depleting Substances

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions

Operation and Maintenance Training

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

Fire Dampers; G

Manual Balancing Dampers; G

Residential Kitchen Exhaust Hood

1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

a. Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL Bld Mat Dir, and UL 6 is acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Outline methods of testing used by the specified agencies.

b. Where materials or equipment are specified to be constructed or

tested, or both, in accordance with the standards of the ASTM International (ASTM), the ASME International (ASME), or other standards, a manufacturer's certificate of compliance of each item is acceptable as proof of compliance.

c. Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.

d. Where products are specified to meet or exceed the specified energy efficiency requirement of FEMP-designated or Energy Star certified product categories, equipment selected shall have as a minimum the efficiency rating identified under "Energy-Efficient Products" at http://www1.eere.energy.gov/femp/procurement.

   1. These specifications conform to the efficiency requirements as defined in Public Law PL-109-58, "Energy Policy Act of 2005" for federal procurement of energy-efficient products. Equipment having a lower efficiency than Energy Star or FEMP requirements may be specified if the designer determines the equipment to be more life-cycle cost effective using the life-cycle cost analysis methodology and procedure in 10 CFR 436.

1.4.1 Prevention of Corrosion

Protect metallic materials against corrosion. Manufacturer shall provide rust-inhibiting treatment and standard finish for the equipment enclosures. Do not use aluminum in contact with earth, and where connected to dissimilar metal. Protect aluminum by approved fittings, barrier material, or treatment. Ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with ASTM A123/A123M for exterior locations and cadmium-plated in conformance with ASTM B766 for interior locations. Provide written certification from the bolt manufacturer that the bolts furnished comply with the requirements of this specification. Include illustrations of product markings, and the number of each type of bolt to be furnished in the certification.

1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

1.4.3 Ozone Depleting Substances Used as Refrigerants

Minimize releases of Ozone Depleting Substances (ODS) during repair, maintenance, servicing or disposal of appliances containing ODSs by complying with all applicable sections of 40 CFR 82 Part 82 Subpart F. Any person conducting repair, maintenance, servicing or disposal of equipment containing refrigerants must comply with the following:

a. Do not knowingly vent or otherwise release into the environment, Class I or Class II substances used as a refrigerant.

b. Do not open appliances without meeting the requirements of 40 CFR 82 Part 82.156 Subpart F, regarding required practices for evacuation and collection of refrigerant, and 40 CFR 82 Part 82.158 Subpart F, regarding standards of recycling and recovery equipment.

c. Only persons who comply with 40 CFR 82 Part 82.161 Subpart F, regarding technician certification, can conduct work on appliances containing refrigerant.

In addition, provide copies of all applicable certifications to the Contracting Officer at least 14 calendar days prior to initiating maintenance, repair, servicing, dismantling or disposal of appliances, including:

a. Proof of Technician Certification.

b. Proof of Equipment Certification for recovery or recycling equipment.

c. Proof of availability of certified recovery or recycling equipment.

1.4.4 Use of Ozone Depleting Substances, Other than Refrigerants

The use of Class I or Class II ODSs listed as nonessential in 40 CFR 82 Part 82.66 Subpart C is prohibited. These prohibited materials and uses include:

a. Any plastic party spray streamer or noise horn which is propelled by a chlorofluorocarbon.

b. Any cleaning fluid for electronic and photographic equipment which contains a chlorofluorocarbon; including liquid packaging, solvent wipes, solvent sprays, and gas sprays.

c. Any plastic flexible or packaging foam product which is manufactured with or contains a chlorofluorocarbon, including, open cell foam, open cell rigid polyurethane poured foam, closed cell extruded polystyrene sheet foam, closed cell polyethylene foam and closed cell polypropylene foam except for flexible or packaging foam used in coaxial cabling.

d. Any aerosol product or other pressurized dispenser which contains a chlorofluorocarbon, except for those listed in 40 CFR 82 Part 82.66 Subpart C.

Request a waiver if a facility requirement dictates that a prohibited material is necessary to achieve project goals. Submit the waiver request in writing to the Contracting Officer. The waiver will be evaluated and dispositioned.

1.4.5 Detail Drawings

Submit detail drawings showing equipment layout, including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gage reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications. Include any information required to demonstrate that the system has been coordinated and functions properly as a unit on the drawings and show equipment relationship to other parts of the work, including clearances required for operation and maintenance. Submit drawings showing bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Submit function designation of the equipment and any other requirements specified throughout this Section with the shop drawings.

1.4.6 Test Procedures

Submit proposed test procedures and test schedules for the ductwork leak test and performance tests of systems at least 2 weeks prior to the start of related testing.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored equipment at the job site from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, cap or plug all pipes until installed.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Reduce Volatile Organic Compounds (VOC) for sealants, coatings or adhesives

Low or no VOCs and no added urea formaldehyde for duct sealants, coatings or adhesives, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC).

2.1.2 Ozone Depleting Substances for Refrigerants

Do not use any Ozone Depleting Substances (ODS) as Refrigerants.

2.2 STANDARD PRODUCTS

Except for the fabricated duct, plenums and casings specified in paragraphs "Metal Ductwork" and "Plenums and Casings for Field-Fabricated Units," provide components and equipment that are standard products of manufacturers regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. This requirement applies to all equipment, including diffusers, registers, fire dampers, and balancing dampers. All energy consuming HVAC equipment must be Energy Star or Federal Energy management Program (FEMP) designated efficiency in conformance to Section 01 33 29 SUSTAINABILITY REPORTING paragraph ENERGY EFFICIENT EQUIPMENT.

a. Standard products are defined as components and equipment that have been in satisfactory commercial or industrial use in similar applications of similar size for at least two years before bid opening.

b. Prior to this two year period, these standard products shall have been sold on the commercial market using advertisements in manufacturers' catalogs or brochures. These manufacturers' catalogs or brochures shall have been copyrighted documents or have been identified with a manufacturer's document number.

c. Provide equipment items that are supported by a service organization. In product categories covered by Energy Star or the Federal Energy Management Program, provide equipment that is listed on the Energy Star Qualified Products List or that meets or exceeds the FEMP-designated Efficiency Requirements.

2.3 IDENTIFICATION PLATES

In addition to standard manufacturer's identification plates, provide engraved laminated phenolic identification plates for each piece of mechanical equipment. Identification plates are to designate the function of the equipment. Submit designation with the shop drawings. Identification plates shall be three layers, black-white-black, engraved to show white letters on black background. Letters shall be upper case. Identification plates 1-1/2 inches high and smaller shall be 1/16 inch thick, with engraved lettering 1/8 inch high; identification plates larger than 1-1/2 inches high shall be 1/8 inch thick, with engraved lettering of suitable height. Identification plates 1-1/2 inches high and larger shall have beveled edges. Install identification plates using a compatible adhesive.

2.4 EQUIPMENT GUARDS AND ACCESS

Fully enclose or guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact according to OSHA requirements. Properly guard or cover with insulation of a type specified, high temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard.

2.5 ELECTRICAL WORK

a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Provide electrical equipment, including motors and wiring, as specified in Section 26 20 00INTERIOR DISTRIBUTION SYSTEM. Provide manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown. For packaged equipment, include manufacturer provided controllers with the required monitors and timed restart.

b. For single-phase motors, provide high-efficiency type, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1.

c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system, and that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Select premium efficiency polyphase motors in accordance with NEMA MG 10.

d. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor. Provide motors rated for continuous duty with the enclosure specified. Provide motor duty that allows for maximum frequency start-stop operation and minimum encountered interval between start and stop. Provide motor torque capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload

protection and other necessary appurtenances. Fit motor bearings with grease supply fittings and grease relief to outside of the enclosure.

e. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controllers are allowed to accomplish the same function. Use solid-state variable-speed controllers for motors rated 10 hp or less and adjustable frequency drives for larger motors. Provide variable frequency drives for motors as specified in Section 26 29 23 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

2.6 ANCHOR BOLTS

Provide anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts to be of the size and number recommended by the equipment manufacturer and located by means of suitable templates. Installation of anchor bolts shall not degrade the surrounding concrete.

2.7 PAINTING

Paint equipment units in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouch only if approved. Otherwise, return equipment to the factory for refinishing.

2.8 INDOOR AIR QUALITY

Provide equipment and components that comply with the requirements of ASHRAE 62.1 unless more stringent requirements are specified herein.

2.9 DUCT SYSTEMS

2.9.1 Metal Ductwork

Provide metal ductwork construction, including all fittings and components, that complies with SMACNA 1966, as supplemented and modified by this specification.

a. Ductwork shall be constructed meeting the requirements for the duct system static pressure as shown on drawings.

b. Provide radius type elbows with a centerline radius of 1.5 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes are allowed.

c. Provide ductwork that meets the requirements of Seal Class A.

d. Provide sealants that conform to fire hazard classification specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS and are suitable for the range of air distribution and ambient temperatures to which it is exposed. Do not use pressure sensitive tape as a sealant.

e. Make spiral lock seam duct, and flat oval with duct sealant and lock with not less than 3 equally spaced drive screws or other approved methods indicated in SMACNA 1966. Apply the sealant to the exposed male part of the fitting collar so that the sealer is on the inside of the joint and fully protected by the metal of the duct fitting. Apply one brush coat of the sealant over the outside of the joint to at least 2 inch band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar are not acceptable.

Fabricate outdoor air intake ducts and plenums with watertight soldered or brazed joints and seams.

2.9.1.1 Metallic Flexible Duct

a. Provide duct that conforms to UL 181 and NFPA 90A with factory-applied insulation, vapor barrier, and end connections. Provide duct assembly that does not exceed 25 for flame spread and 50 for smoke developed. Provide ducts designed for working pressures of 2 inches water gauge positive and 1.5 inches water gauge negative. Provide flexible round duct length that does not exceed 5 feet. Secure connections by applying adhesive for 2 inches over rigid duct, apply flexible duct 2 inches over rigid duct, apply metal clamp, and provide minimum of three No. 8 sheet metal screws through clamp and rigid duct.

b. Inner duct core: Provide interlocking spiral or helically corrugated flexible core constructed of zinc-coated steel, aluminum, or stainless steel; or constructed of inner liner of continuous galvanized spring steel wire helix fused to continuous, fire-retardant, flexible vapor barrier film, inner duct core.

2.9.1.2 Insulated Nonmetallic Flexible Duct Runouts

Use flexible duct runouts only where indicated. Runout length is indicated on the drawings, and is not to exceed 5 feet. Provide runouts that are preinsulated, factory fabricated, and that comply with NFPA 90A and UL 181. Provide either field or factory applied vapor barrier. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene. Where coil induction or high velocity units are supplied with vertical air inlets, use a streamlined, vaned and mitered elbow transition piece for connection to the flexible duct or hose. Provide a die-stamped elbow and not a flexible connector as the last elbow to these units other than the vertical air inlet type. Insulated flexible connectors are allowed as runouts. Provide insulated material and vapor barrier that conform to the requirements of Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Do not expose the insulation material surface to the air stream.

2.9.1.3 General Service Duct Connectors

Provide a flexible duct connector approximately 6 inches in width where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, secure the flexible material by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, install the flexible material locked to metal collars using normal duct construction methods. Provide a composite connector system that complies with NFPA 701 and is classified as "flame-retardant fabrics" in UL Bld Mat Dir.

2.9.2 Duct Access Doors

Provide hinged access doors conforming to SMACNA 1966 in ductwork and plenums where indicated and at all air flow measuring primaries, automatic dampers, fire dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system. Provide access doors upstream and downstream of air flow measuring primaries and heating and cooling coils. Provide doors that are a minimum 8 by 8 inches, unless otherwise shown. Where duct size does not accommodate this size door, make the doors as large as practicable. Equip doors 24 by 24 inches or larger with

fasteners operable from inside and outside the duct. Use insulated type doors in insulated ducts.

2.9.3 Fire Dampers

Use 1.5 hour rated fire dampers unless otherwise indicated. Provide fire dampers that conform to the requirements of NFPA 90A and UL 555. Perform the fire damper test as outlined in NFPA 90A. Provide a pressure relief door upstream of the fire damper. If the ductwork connected to the fire damper is to be insulated, then provide a factory installed pressure relief damper. Provide automatic operating fire dampers with a dynamic rating suitable for the maximum air velocity and pressure differential to which it is subjected. Provide fire dampers approved for the specific application, and install according to their listing. Equip fire dampers with a steel sleeve or adequately sized frame installed in such a manner that disruption of the attached ductwork, if any, does not impair the operation of the damper. Equip sleeves or frames with perimeter mounting angles attached on both sides of the wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce the ceiling of the assemblies in conformance with UL Fire Resistance. Provide curtain type with damper blades in the air stream fire dampers. Install dampers that do not reduce the duct or the air transfer opening cross-sectional area. Install dampers so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness. Unless otherwise indicated, comply with the installation details given in SMACNA 1819 and in manufacturer's instructions for fire dampers. Perform acceptance testing of fire dampers according to paragraph Fire Damper Acceptance Test and NFPA 90A.

2.9.4 Manual Balancing Dampers

a. Furnish manual balancing dampers with accessible operating mechanisms. Use chromium plated operators (with all exposed edges rounded) in finished portions of the building. Provide manual volume control dampers that are operated by locking-type quadrant operators.

b. Unless otherwise indicated, provide opposed blade type multileaf dampers with maximum blade width of 12 inches. Provide access doors or panels for all concealed damper operators and locking setscrews. Provide access doors or panels in hard ceilings, partitions and walls for access to all concealed damper operators and damper locking setscrews. Coordinate location of doors or panels with other affected contractors.

c. Provide stand-off mounting brackets, bases, or adapters not less than the thickness of the insulation when the locking-type quadrant operators for dampers are installed on ducts to be thermally insulated, to provide clearance between the duct surface and the operator. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

2.9.4.1 Square or Rectangular Dampers

Duct Height 12 inches and Less:

a. Frames:

Width	Height	Galvanized Steel Thickness	Length
Maximum 19 inches	Maximum 12 inches	Minimum 20 gage	Minimum 3 inches
More than 19 inches	Maximum 12 inches	Minimum 16 gage	Minimum 3 inches

b. Single Leaf Blades:

Width	Height	Galvanized Steel Thickness	Length
Maximum 19 inches	Maximum 12 inches	Minimum 20 gage	Minimum 3 inches
More than 19 inches	Maximum 12 inches	Minimum 16 gage	Minimum 3 inches

c. Blade Axles:

1. To support the blades of round dampers, provide galvanized steel shafts supporting the blade the entire duct diameter frame-to-frame. Axle shafts shall extend through standoff bracket and hand quadrant.

Width	Height	Material	Square Shaft
Maximum 19 inches	Maximum 12 inches	Galvanized Steel	Minimum 3/8 inch
More than 19 inches	Maximum 12 inches	Galvanized Steel	Minimum 1/2 inch

d. Axle Bearings:

1. Support the shaft on each end at the frames with shaft bearings. Shaft bearings configuration shall be a pressed fit to provide a tight joint between blade shaft and damper frame.

Width	Height	Material
Maximum 19 inches	Maximum 12 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
More than 19 inches	Maximum 12 inches	oil-impregnated bronze

e. Control Shaft/Hand Quadrant:

1. Provide dampers with accessible locking-type control shaft/hand quadrant operators.

2. Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be thermally insulated. Stand-off distance shall be a minimum of

2 inches off the metal duct surface. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

f. Finish:

1. Mill Galvanized.

Duct Height Greater than 12 inches:

a. Dampers:

1. Provide dampers with multi-leaf opposed-type blades.

b. Frames:

1. Maximum 48 inches in height; maximum 48 inches in width; minimum of 16 gage galvanized steel, minimum of 5 inches long.

c. Blades:

1. Minimum of 16 gage galvanized steel; 6 inch nominal width.

d. Blade Axles:

1. To support the blades of round dampers, provide galvanized square steel shafts supporting the blade the entire duct diameter frame-to-frame. Axle shafts shall extend through standoff bracket and hand quadrant.

e. Axle Bearings:

1. Support the shaft on each end at the frames with shaft bearings constructed of oil-impregnated bronze, or solid nylon, or a solid plastic equivalent to nylon. Shaft bearings configuration shall be a pressed fit to provide a tight joint between blade shaft and damper frame.

f. Blade Actuator:

1. Minimum 1/2 inch diameter galvanized steel.

g. Blade Actuator Linkage:

1. Mill Galvanized steel bar and crank plate with stainless steel pivots.

h. Control Shaft/Hand Quadrant:

1. Provide dampers with accessible locking-type control shaft/hand quadrant operators.

2. Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be thermally insulated. Stand-off distance shall be a minimum of 2 inches off the metal duct surface. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

i. Finish:

1. Mill Galvanized.

2.9.4.2 Round Dampers

Frames:

Size	Galvanized Steel Thickness	Length
4 to 20 inches	Minimum 20 gage	Minimum 6 inches
22 to 30 inches	Minimum 20 gage	Minimum 10 inches
32 to 40 inches	Minimum 16 gage	Minimum 10 inches

Blades:

Size	Galvanized Steel Thickness
4 to 20 inches	Minimum 20 gage
22 to 30 inches	Minimum 16 gage
32 to 40 inches	Minimum 10 gage

Blade Axles:

a. To support the blades of round dampers, provide galvanized steel shafts supporting the blade the entire duct diameter frame-to-frame. Axle shafts shall extend through standoff bracket and hand quadrant.

Size	Shaft Size and Shape
4 to 20 inches	Minimum 3/8 inch square
22 to 30 inches	Minimum 1/2 inch square
32 to 40 inches	Minimum 3/4 inch square

Axle Bearings:

a. Support the shaft on each end at the frames with shaft bearings constructed of oil-impregnated bronze, or solid nylon, or a solid plastic equivalent to nylon. Shaft bearings configuration shall be a pressed fit to provide a tight joint between blade shaft and damper frame.

Size	Material
4 to 20 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
22 to 30 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
32 to 40 inches	oil-impregnated bronze, or stainless steel sleeve bearing

Control Shaft/Hand Quadrant:

a. Provide dampers with accessible locking-type control shaft/hand quadrant operators.

b. Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be thermally insulated. Stand-off distance shall be a minimum of 2 inches off the metal duct surface. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

Finish:

a. Mill Galvanized.

2.9.5 Automatic Balancing Dampers

Provide dampers as specified in paragraph SUPPLEMENTAL COMPONENTS/SERVICES, subparagraph CONTROLS.

2.9.6 Air Supply and Exhaust Air Dampers

Where outdoor air supply and exhaust air dampers are required, they shall have a maximum leakage rate when tested in accordance with AMCA 500-D as required by ASHRAE 90.1 - IP and UFC 4-010-01, including maximum Damper Leakage for:

a. The maximum damper leakage at 1.0 inch w.g. is 3 cfm per square foot.

Dampers smaller than 24 inches in either direction may have leakage of 40 cfm per square foot.

2.9.7 Diffusers, Registers, and Grilles

Provide factory-fabricated units of aluminum that distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Provide outlets for diffusion, spread, throw, and noise level as required for specified performance. Certify performance according to ASHRAE 70. Provide sound rated and certified inlets and outlets according to ASHRAE 70. Provide sound power level as indicated. Provide registers with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device is acceptable. Provide opposed blade type volume dampers for all diffusers and registers, except linear slot diffusers. Provide linear slot diffusers with round or elliptical balancing dampers. Where the inlet and outlet openings are located less

than 7 feet above the floor, protect them by a grille or screen according to NFPA 90A.

2.9.7.1 Diffusers

Provide diffuser types indicated. Furnish ceiling mounted units with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Provide diffusers with air deflectors of the type indicated. Provide air handling troffers or combination light and ceiling diffusers conforming to the requirements of UL Electrical Constructn for the interchangeable use as cooled or heated air supply diffusers or return air units. Install ceiling mounted units with rims tight against ceiling. Provide sponge rubber gaskets between ceiling and surface mounted diffusers for air leakage control. Provide suitable trim for flush mounted diffusers. For connecting the duct to diffuser, provide duct collar that is airtight and does not interfere with volume controller. Provide return or exhaust units that are similar to supply diffusers.

2.9.7.2 Registers

Double-deflection supply registers. Provide manufacturer-furnished volume dampers. Provide volume dampers of the group-operated, opposed-blade type and key adjustable by inserting key through face of register. Operating mechanism shall not project through any part of the register face. Automatic volume control devices are acceptable. Provide exhaust and return registers as specified for supply registers, except provide exhaust and return registers that have a single set of nondirectional face bars or vanes having the same appearance as the supply registers.

2.9.8 Louvers

Provide louvers for installation in exterior walls that are associated with the air supply and distribution system as specified in Section 08 91 00 METAL WALL LOUVERS.

2.9.9 Residential Kitchen Exhaust Hood

Provide Residential two speed kitchen hood with washable aluminum filter. Hood shall be separate switches for light and two speed fan. Sides shall be mitered and bottom edge hemmed - with no sharp edges. Hood shall be white and be UL listed.

2.9.10 Wall Vents

Fabricate wall vents from aluminum sheets with aluminum structural shapes. Provide sheet metal thickness, reinforcement, and fabrication that conform to SMACNA 1966. Provide vents with bird screen.

2.9.11 Bird Screens and Frames

Provide bird screens that conform to ASTM E2016, No. 2 mesh, aluminum or stainless steel. Provide "medium-light" rated aluminum screens. Provide "light" rated stainless steel screens. Provide removable type frames fabricated from either stainless steel or extruded aluminum.

2.10 SUPPLEMENTAL COMPONENTS/SERVICES

2.10.1 Condensate Drain Lines

Provide and install condensate drainage for each item of equipment that generates condensate in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE except as modified herein.

2.10.2 Insulation

The requirements for shop and field applied insulation are specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.10.3 Controls

The requirements for controls are specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

PART 3 EXECUTION

3.1 CONSTRUCTION-RELATED SUSTAINABILITY CRITERIA

Perform and document Indoor Air Quality During Construction. Provide documentation showing that after construction ends, and prior to occupancy, new filters were installed in conformance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph INDOOR AIR QUALITY DURING CONSTRUCTION.

3.2 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.3 INSTALLATION

a. Install materials and equipment in accordance with the requirements of the contract drawings and approved manufacturer's installation instructions. Accomplish installation by workers skilled in this type of work. Perform installation so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors.

b. No installation is permitted to block or otherwise impede access to any existing machine or system. Install all hinged doors to swing open a minimum of 120 degrees. Provide an area in front of all access doors that clears a minimum of 3 feet. In front of all access doors to electrical circuits, clear the area the minimum distance to energized circuits as specified in OSHA Standards, part 1910.333 (Electrical-Safety Related work practices) and an additional 3 feet.

c. Except as otherwise indicated, install emergency switches and alarms in conspicuous locations. Mount all indicators, to include gauges, meters, and alarms in order to be easily visible by people in the area.

3.3.1 Condensate Drain Lines

Provide water seals in the condensate drain from all units. Provide a depth of each seal of 2 inches plus the number of inches, measured in water gauge, of the total static pressure rating of the unit to which the drain is connected. Provide water seals that are constructed of 2 tees

and an appropriate U-bend with the open end of each tee plugged. Provide pipe cap or plug cleanouts where indicated. Connect drains indicated to connect to the sanitary waste system using an indirect waste fitting. Insulate air conditioner drain lines as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.3.2 Equipment and Installation

Provide frames and supports for tanks, compressors, pumps, valves, air handling units, fans, coils, dampers, and other similar items requiring supports. Floor mount or ceiling hang air handling units as indicated. Anchor and fasten as detailed.

3.3.3 Access Panels

Install access panels for concealed valves, vents, controls, dampers, and items requiring inspection or maintenance of sufficient size, and locate them so that the concealed items are easily serviced and maintained or completely removed and replaced. Provide access panels as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

3.3.4 Flexible Duct

Install pre-insulated flexible duct in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Provide hangers, when required to suspend the duct, of the type recommended by the duct manufacturer and set at the intervals recommended.

3.3.5 Metal Ductwork

Install according to SMACNA 1966 unless otherwise indicated. Install duct supports for sheet metal ductwork according to SMACNA 1966, unless otherwise specified. Do not use friction beam clamps indicated in SMACNA 1966. Anchor risers on high velocity ducts in the center of the vertical run to allow ends of riser to move due to thermal expansion. Erect supports on the risers that allow free vertical movement of the duct. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C-clamps are used, provide retainer clips.

3.3.6 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, perform temporary dust control protection. Protect the distribution system (supply and return) with temporary seal-offs at all inlets and outlets at the end of each day's work. Keep temporary protection in place until system is ready for startup.

3.3.7 Insulation

Provide thickness and application of insulation materials for ductwork, piping, and equipment according to Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.3.8 Duct Test Holes

Provide holes with closures or threaded holes with plugs in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Plug insulated duct at the duct surface, patched over with insulation and then marked to indicate location of test hole if needed for future use.

3.3.9 Power Transmission Components Adjustment

Test V-belts and sheaves for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Uniformly load belts on drive side to prevent bouncing. Make alignment of direct driven couplings to within 50 percent of manufacturer's maximum allowable range of misalignment.

3.4 EQUIPMENT PADS

Provide equipment pads to the dimensions shown or, if not shown, to conform to the shape of each piece of equipment served with a minimum 3-inch margin around the equipment and supports. Allow equipment bases and foundations, when constructed of concrete or grout, to cure a minimum of 14 calendar days before being loaded.

3.5 CUTTING AND PATCHING

Install work in such a manner and at such time that a minimum of cutting and patching of the building structure is required. Make holes in exposed locations, in or through existing floors, by drilling and smooth by sanding. Use of a jackhammer is permitted only where specifically approved. Make holes through masonry walls to accommodate sleeves with an iron pipe masonry core saw.

3.6 CLEANING

Thoroughly clean surfaces of piping and equipment that have become covered with dirt, plaster, or other material during handling and construction before such surfaces are prepared for final finish painting or are enclosed within the building structure. Before final acceptance, clean mechanical equipment, including piping, ducting, and fixtures, and free from dirt, grease, and finger marks. When the work area is in an occupied space such as office, laboratory or warehouse, protect all furniture and equipment from dirt and debris. Incorporate housekeeping for field construction work which leaves all furniture and equipment in the affected area free of construction generated dust and debris; and, all floor surfaces vacuum-swept clean.

3.7 PENETRATIONS

Provide sleeves and prepared openings for duct mains, branches, and other penetrating items, and install during the construction of the surface to be penetrated. Cut sleeves flush with each surface. Place sleeves for round duct 15 inches and smaller. Build framed, prepared openings for round duct larger than 15 inches and square, rectangular or oval ducts. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Provide 1 inch clearance between penetrating and penetrated surfaces except at grilles, registers, and diffusers. Pack spaces between sleeve or opening and duct or duct insulation with mineral fiber conforming with ASTM C553, Type 1, Class B-2.

3.7.1 Sleeves

Fabricate sleeves, except as otherwise specified or indicated, from 20 gage thick mill galvanized sheet metal. Where sleeves are installed in bearing walls or partitions, provide black steel pipe conforming with ASTM A53/A53M, Schedule 20.

3.7.2 Framed Prepared Openings

Fabricate framed prepared openings from 20 gage galvanized steel, unless otherwise indicated.

3.7.3 Insulation

Provide duct insulation in accordance with Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS continuous through sleeves and prepared openings except firewall penetrations. Terminate duct insulation at fire dampers and flexible connections. For duct handling air at or below 60 degrees F, provide insulation continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air.

3.7.4 Closure Collars

Provide closure collars of a minimum 4 inches wide, unless otherwise indicated, for exposed ducts and items on each side of penetrated surface, except where equipment is installed. Install collar tight against the surface and fit snugly around the duct or insulation. Grind sharp edges smooth to prevent damage to penetrating surface. Fabricate collars for round ducts 15 inches in diameter or less from 20 gage galvanized steel. Fabricate collars for square and rectangular ducts, or round ducts with minimum dimension over 15 inches from 18 gage galvanized steel. Fabricate collars for square and rectangular ducts with a maximum side of 15 inches or less from 20 gage galvanized steel. Install collars with fasteners a maximum of 6 inches on center. Attach to collars a minimum of 4 fasteners where the opening is 12 inches in diameter or less, and a minimum of 8 fasteners where the opening is 20 inches in diameter or less.

3.7.5 Firestopping

Where ducts pass through fire-rated walls, fire partitions, and fire rated chase walls, seal the penetration with fire stopping materials as specified in Section 07 84 00 FIRESTOPPING.

3.8 FIELD PAINTING OF MECHANICAL EQUIPMENT

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except clean to bare metal on metal surfaces subject to temperatures in excess of 120 degrees F. Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Provide aluminum or light gray finish coat.

3.8.1 Temperatures Less than 120 degrees F

Immediately after cleaning, apply one coat of pretreatment primer applied

to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat to metal surfaces subject to temperatures less than 120 degrees F.

3.8.2 Temperatures between 120 and 400 degrees F

Apply two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of two mils to metal surfaces subject to temperatures between 120 and 400 degrees F.

3.8.3 Finish Painting

The requirements for finish painting of items only primed at the factory, and surfaces not specifically noted otherwise, are specified in Section 09 90 00 PAINTS AND COATINGS.

3.9 IDENTIFICATION SYSTEMS

Provide identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and item number on all valves and dampers. Provide tags that are 1-3/8 inch minimum diameter with stamped or engraved markings. Make indentations black for reading clarity. Attach tags to valves with No. 12 AWG 0.0808-inch diameter corrosion-resistant steel wire, copper wire, chrome-plated beaded chain or plastic straps designed for that purpose.

3.10 DUCTWORK LEAK TESTS

The requirements for ductwork leak tests are specified in Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC.

3.11 DAMPER ACCEPTANCE TEST

Submit the proposed schedule at least 2 weeks prior to the start of test. Operate all fire dampers and smoke dampers under normal operating conditions prior to the occupancy of a building to determine that they function properly. Test each fire damper equipped with fusible link by having the fusible link cut in place. Test dynamic fire dampers with the air handling and distribution system running. Reset all fire dampers with the fusible links replaced after acceptance testing. To ensure optimum operation and performance, install the damper so it is square and free from racking.

3.12 TESTING, ADJUSTING, AND BALANCING

The requirements for testing, adjusting, and balancing are specified in Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC. Begin testing, adjusting, and balancing only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.13 CLEANING AND ADJUSTING

Thoroughly clean ducts, plenums, and casing of debris and blow free of small particles of rubbish and dust and then vacuum clean before installing outlet faces. Wipe equipment clean, with no traces of oil, dust, dirt, or paint spots. Provide temporary filters prior to startup of all fans that are operated during construction, and install new filters

after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. Maintain system in this clean condition until final acceptance. Properly lubricate bearings with oil or grease as recommended by the manufacturer. Tighten belts to proper tension. Adjust control valves and other miscellaneous equipment requiring adjustment to setting indicated or directed. Adjust fans to the speed indicated by the manufacturer to meet specified conditions. Maintain all equipment installed under the contract until closeout documentation is received, the project is completed and the building has been documented as beneficially occupied.

3.14 OPERATION AND MAINTENANCE

3.14.1 Operation and Maintenance Manuals

Submit six manuals at least 2 weeks prior to field training. Submit data complying with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA. Submit Data Package 3 for the items/units listed under SD-10 Operation and Maintenance Data

3.14.2 Operation and Maintenance Training

Conduct a training course for the members of the operating staff as designated by the Contracting Officer. Make the training period consist of a total of 16 hours of normal working time and start it after all work specified herein is functionally completed and the Performance Tests have been approved. Conduct field instruction that covers all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations. Submit the proposed On-site Training schedule concurrently with the Operation and Maintenance Manuals and at least 14 days prior to conducting the training course.

-- End of Section --

SECTION 23 03 00.00 20

BASIC MECHANICAL MATERIALS AND METHODS
08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1.3 RELATED REQUIREMENTS

This section applies to all sections of Divisions: 21, FIRE SUPPRESSION; 22, PLUMBING; and 23, HEATING, VENTILATING, AND AIR CONDITIONING of this project specification, unless specified otherwise in the individual section.

1.4 QUALITY ASSURANCE

1.4.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.4.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.4.3 Service Support

The equipment items must be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These

service organizations must be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.4.4 Manufacturer's Nameplate

For each item of equipment, provide a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.4.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

1.4.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" is interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" must be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" must be interpreted to mean the "lessor." References to the "permit holder" must be interpreted to mean the "Contractor."

1.4.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, must be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.6 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors must conform to and have electrical connections provided under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and must have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of

additional electrical service and related work must be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

Instruction must be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished must be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors must withstand 3000 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117, and for that test the acceptance criteria must be as follows: Immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment must not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory

painting system must be designed for the temperature service.

3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F must be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat must be aluminum or light gray.

a. Temperatures Less than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F must receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of 1 mil; and two coats of enamel applied to a minimum dry film thickness of 1 mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F must receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

-- End of Section --

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 62.1	(2010; Errata 2011; INT 3 2012; INT 4 2012; INT 5 2013) Ventilation for Acceptable Indoor Air Quality

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(2002; 6th ed) National Standards for Total System Balance
AABC MN-4	(1996) Test and Balance Procedures

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV	(2006) Procedural Standards for Measurements and Assessment of Sound and Vibration
NEBB PROCEDURAL STANDARDS	(2005) Procedural Standards for TAB (Testing, Adjusting and Balancing) Environmental Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1780	(2002) HVAC Systems - Testing, Adjusting and Balancing, 3rd Edition
SMACNA 1858	(2004) HVAC Sound And Vibration Manual - First Edition
SMACNA 1972 CD	(2012) HVAC Air Duct Leakage Test Manual - 2nd Edition

1.2 DEFINITIONS

a. AABC: Associated Air Balance Council.

b. COTR: Contracting Officer's Technical Representative.

c. DALT: Duct air leakage test.

d. DALT'd: Duct air leakage tested.

e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling.

f. NEBB: National Environmental Balancing Bureau.

g. Out-of-tolerance data: Pertains only to field acceptance testing of Final DALT or TAB report. When applied to DALT work, this phase means "a leakage rate measured during DALT field acceptance testing which exceeds the leakage rate allowed by SMACNA Leak Test Manual for an indicated duct construction and sealant class." When applied to TAB work this phase means "a measurement taken during TAB field acceptance testing which does not fall within the range of plus 5 to minus 5 percent of the original measurement reported on the TAB Report for a specific parameter."

h. TAB: Testing, adjusting, and balancing (of HVAC systems).

i. TAB'd: HVAC Testing/Adjusting/Balancing procedures performed.

j. TAB Agency: TAB Firm.

k. TAB team field leader: TAB team field leader.

l. TAB team supervisor: TAB team engineer.

m. TAB team technicians: TAB team assistants.

n. TAB team field leader: TAB team field leader.

o. TAB team supervisor: TAB team engineer.

p. TAB team technicians: TAB team assistants.

q. TABB: Testing Adjusting and Balancing Bureau.

1.2.1 Similar Terms

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results.

The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC, NEBB, or TABB requirements where differences exist.

SIMILAR TERMS			
Contract Term	AABC Term	NEBB Term	TABB Term
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems	International Standards for Environmental Systems Balance
TAB Specialist	TAB Engineer	TAB Supervisor	TAB Supervisor
Systems Readiness Check	Construction Phase Inspection	Field Readiness Check & Preliminary Field Procedures	Field Readiness Check & Prelim. Field Procedures

1.3 WORK DESCRIPTION

The work includes duct air leakage testing (DALT) and testing, adjusting, and balancing (TAB) of new and existing heating, ventilating, and cooling (HVAC) air and water distribution systems including equipment and performance data, ducts, and piping which are located within, on, under, between, and adjacent to buildings, including records of existing conditions. The work also includes testing and balancing domestic hot water recirculation balance valves and associated recirculating pump.

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. Comply with requirements of AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 (TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Conduct DALT testing on all new ductwork in compliance with the requirements specified in SMACNA 1972 CD, except as supplemented and modified by this section. Conduct DALT and TAB work in accordance with the requirements of this section.

1.3.1 Air Distribution Systems

Test, adjust, and balance systems (TAB) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.2 Water Distribution Systems

TAB systems in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd.

Terminate piping insulation immediately adjacent to each flow control valve, automatic control valve, or device. Seal the ends of pipe insulation and the space between ends of pipe insulation and piping, with waterproof vapor barrier coating.

After completion of work under this section, insulate the flow control valves and devices as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.3 TAB SCHEMATIC DRAWINGS

Show the following information on TAB Schematic Drawings:

a. A unique number or mark for each piece of equipment or terminal.

b. Air quantities at air terminals.

c. Air quantities and temperatures in air handling unit schedules.

d. Water quantities and temperatures in thermal energy transfer equipment schedules.

e. Water quantities and heads in pump schedules.

f. Water flow measurement fittings and balancing fittings.

g. Ductwork Construction and Leakage Testing Table that defines the DALT test requirements, including each applicable HVAC duct system ID or mark, duct pressure class, duct seal class, and duct leakage test pressure. This table is included in the file for Graphics for Unified Facilities Guide Specifications: http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.

The Testing, Adjusting, and Balancing (TAB) Specialist must review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the effective and accurate TAB of the system, including records of existing conditions, and systems readiness check. The TAB Specialist must provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation. The Testing, Adjusting, and Balancing (TAB) Specialist must review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the effective and accurate TAB of the system, including records of existing conditions, and systems readiness check. The TAB Specialist must provide a TAB Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

Submit three copies of the TAB Schematic Drawings and Report Forms to the Contracting Officer, no later than 21 days prior to the start of TAB field measurements.

1.3.4 Related Requirements

Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS applies to work specified in this section.

Requirements for price breakdown of HVAC TAB work are specified in Section 01 32 17.00 20 COST LOADED NETWORK ANALYSIS SCHEDULES (NAS).

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Records of Existing Conditions; G

Independent TAB Agency and Personnel Qualifications; G

TAB Design Review Report; G

TAB Firm; G

SD-02 Shop Drawings

TAB Schematic Drawings and Report Forms; G

SD-03 Product Data

Equipment and Performance Data; G

TAB Related HVAC Submittals; G

A list of the TAB Related HVAC Submittals, no later than 7 days after the approval of the TAB team engineer and assistant.

TAB Verification; G

SD-06 Test Reports

Completed Pre-Final DALT Report; G

Certified Final DALT Report; G

Prerequisite HVAC Work Check out List; G

Completed Pre-Final TAB Report; G

Certified Final TAB Report; G

TAB Design Review Report; G

SD-07 Certificates

Independent TAB Agency and Personnel Qualifications; G

DALT and TAB Submittal and Work Schedule; G

TAB Pre-Field Engineering Report; G

Instrument Calibration Certificates; G

DALT and TAB Procedures Summary; G

Completed Pre-Final DALT Work Checklist; G

Advance Notice of Pre-Final DALT Field Work; G

Advance Notice of TAB Field Work; G

TAB Firm; G

1.5 QUALITY ASSURANCE

1.5.1 Independent TAB Agency and Personnel Qualifications

To secure approval for the proposed agency, submit information certifying that the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including design, furnishing equipment, or construction. Further, submit the following, for the agency, to Contracting Officer for approval:

a. Independent AABC or NEBB or TABB TAB agency:

1. TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification; or TABB certification number and expiration date of current certification.

2. TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB supervisor certificate and expiration date of current certification.

3. TAB team field leader: Name and documented evidence that the team field leader has satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

4. TAB team field technicians: Names and documented evidence that each field technician has satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

5. Current certificates: Registrations and certifications are current, and valid for the duration of this contract. Renew Certifications which expire prior to completion of the TAB work, in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification are not to perform TAB work on this contract.

b. TAB Team Members: TAB team approved to accomplish work on this contract are full-time employees of the TAB agency. No other personnel is allowed to do TAB work on this contract.

c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

1.5.1.1 TAB Standard

Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780, unless otherwise specified

herein. All recommendations and suggested practices contained in the TAB Standard are considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practical, to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations.

All quality assurance provisions of the TAB Standard such as performance guarantees are part of this contract. For systems or system components not covered in the TAB Standard, TAB procedures must be developed by the TAB Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are considered mandatory, including the latest requirements of ASHRAE 62.1.

1.5.1.2 Qualifications

a. TAB Firm:

1. The TAB Firm must be either a member of AABC or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications, including building systems commissioning.

2. Certification must be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, the Contractor must immediately notify the Contracting Officer and submit another TAB Firm for approval. Any firm that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections to be performed by the TAB Firm will be considered invalid if the TAB Firm loses its certification prior to Contract completion and must be performed by an approved successor.

3. These TAB services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The TAB Firm must be a prime subcontractor of the Contractor and be financially and corporately independent of the mechanical subcontractor, reporting directly to and paid by the Contractor.

b. TAB Specialist:

1. The TAB Specialist must be either a member of AABC, an experienced technician of the Firm certified by the NEBB, or a Supervisor certified by the TABB. The certification must be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, immediately notify the Contracting Officer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not eligible to perform any duties related to the HVAC systems,

including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist will be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by the approved successor.

c. TAB Specialist Responsibilities:

1. TAB Specialist responsibilities include all TAB work specified herein and in related sections under his direct guidance. The TAB specialist is required to be onsite on a daily basis to direct TAB efforts. The TAB Specialist must participate in the commissioning process.

1.5.1.3 TAB Related HVAC Submittals

The TAB Specialist must prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all HVAC TAB. Accompany the submittals identified on this list with a letter of approval signed and dated by the TAB Specialist when submitted to the Government. Ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

1.5.2 Responsibilities

The Contractor is responsible for ensuring compliance with the requirements of this section. The following delineation of specific work responsibilities is specified to facilitate TAB execution of the various work efforts by personnel from separate organizations. This breakdown of specific duties is specified to facilitate adherence to the schedule listed in the paragraph TAB SUBMITTAL AND WORK SCHEDULE.

1.5.2.1 Contractor

a. TAB personnel: Ensure that the DALT work and the TAB work is accomplished by a group meeting the requirements specified in the paragraph TAB PERSONNEL QUALIFICATION REQUIREMENTS.

b. Pre-DALT/TAB meeting: Attend the meeting with the TAB Supervisor, and ensure that a representative is present for the sheetmetal contractor, mechanical contractor, electrical contractor, and automatic temperature controls contractor.

c. HVAC documentation: Furnish one complete set of the following HVAC-related documentation to the TAB agency:

1. Contract drawings and specifications.

2. Approved submittal data for equipment.

3. Construction work schedule.

4. Up-to-date revisions and change orders for the previously listed items.

d. Submittal and work schedules: Ensure that the schedule for submittals and work required by this section and specified in the paragraph TAB SUBMITTAL AND WORK SCHEDULE is met.

e. Coordination of supporting personnel:

1. Provide the technical personnel, such as factory representatives or HVAC controls installer required by the TAB field team to support the DALT and the TAB field measurement work.

2. Provide equipment mechanics to operate HVAC equipment and ductwork mechanics to provide the field designated test ports to enable TAB field team to accomplish the DALT and the TAB field measurement work. Ensure these support personnel are present at the times required by the TAB team, and cause no delay in the DALT and the TAB field work.

3. Conversely, ensure that the HVAC controls installer has required support from the TAB team field leader to complete the controls check out.

f. Deficiencies: Ensure that the TAB Agency supervisor submits all Design/Construction deficiency notifications directly to the Contracting officer within 3 days after the deficiency is encountered. Further, ensure that all such notification submittals are complete with explanation, including documentation, detailing deficiencies. Correct each deficiency as soon as practical with the Contracting Officer, and submit revised schedules and other required documents.

g. Prerequisite HVAC work: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Include as prerequisite work items, the deficiencies pointed out by the TAB team supervisor in the design review report.

h. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. Do not allow the TAB team to commence TAB field work until all of the following are completed.

1. HVAC system installations are fully complete.

2. HVAC prerequisite checkout work lists specified in the paragraph PRE-FIELD TAB ENGINEERING REPORT are completed, submitted, and approved. Ensure that the TAB Agency gets a copy of the approved prerequisite HVAC work checklist.

3. DALT field checks for all systems are completed.

4. HVAC system filters are clean for both Season 1 and Season 2 TAB field work.

i. Advance notice: Furnish to the Contracting Officer with advance written notice for the commencement of the DALT field work and for the commencement of the TAB field work.

j. Insulation work: For required DALT work , ensure that insulation is not installed on ducts to be DALT'd until DALT work on the subject ducts is complete. Later, ensure that openings in duct and machinery

insulation coverings for TAB test ports are marked, closed and sealed.

1.5.2.2 TAB Agency

Provide the services of a TAB team which complies with the requirements of the paragraph INDEPENDENT TAB AGENCY PERSONNEL QUALIFICATIONS. The work to be performed by the TAB agency is limited to testing, adjusting, and balancing of HVAC air and water systems to satisfy the requirements of this specification section.

1.5.2.3 TAB Team Supervisor

a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical DALT and TAB procedures and TAB team field work.

b. Pre-DALT/TAB meeting: Attend meeting with Contractor.

c. Design review report: Review project specifications and accompanying drawings to verify that the air systems and water systems are designed in such a way that the TAB engineer can accomplish the work in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.

d. Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report, the during the DALT or TAB field work.

    1. Ensure the Contractor is properly notified and aware of all support personnel needed to perform the TAB work. Maintain communication with the Contractor regarding support personnel throughout the duration of the TAB field work, including the TAB field acceptance testing checking.

    2. Ensure all inspections and verifications for the Pre-Final DALT and Pre-Tab Checklists are completely and successfully conducted before DALT and TAB field work is performed.

e. Pre-field DALT preliminary notification: Monitor the completion of the duct installation of each system and provide the necessary written notification to the Contracting Officer.

f. Pre-field engineering report: Utilizing the following HVAC-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.

g. Prerequisite HVAC work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.

h. Technical assistance for DALT work.

1. Technical assistance: Provide immediate technical assistance to TAB field team.

2. DALT field visit: Near the end of the DALT field work effort, visit the contract site to inspect the HVAC installation and the progress of the DALT field work. Conduct a site visit to the extent necessary to verify correct procedures are being implemented and to confirm the accuracy of the Pre-final DALT Report data which has been reported. Also, perform sufficient evaluation to allow the TAB supervisor to issue certification of the final report. Conduct the site visit full-time for a minimum of one 8 hour workday duration.

i. Final DALT report: Certify the DALT report. This certification includes the following work:

1. Review: Review the Pre-final DALT report data. From these field reports, prepare the Certified Final DALT report.

2. TAB Verification: Verify adherence, by the TAB field team, to the procedures specified in this section.

j. Technical Assistance for TAB Work: Provide immediate technical assistance to the TAB field team for the TAB work.

1. TAB field visit: Near the end of the TAB field work effort, visit the contract site to inspect the HVAC installation and the progress of the TAB field work. Conduct site visit full-time for a minimum of one 8 hour workday duration. Review the TAB final report data and certify the TAB final report.

k. Certified TAB report: Certify the TAB report. This certification includes the following work:

1. Review: Review the TAB field data report. From this field report, prepare the certified TAB report.

2. Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

l. Design/Construction deficiencies: Within 3 working days after the TAB Agency has encountered any design or construction deficiencies, the TAB Supervisor must submit written notification directly to the Contracting Officer, with a separate copy to the Contractor, of all such deficiencies. Provide in this submittal a complete explanation, including supporting documentation, detailing deficiencies. Where deficiencies are encountered that are believed to adversely impact successful completion of TAB, the TAB Agency must issue notice and request direction in the notification submittal.

m. TAB Field Check: The TAB team supervisor must attend and supervise TAB field check.

1.5.2.4 TAB Team Field Leader

a. Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, EXECUTION.

b. Full time: Be present at the contract site when DALT field work or TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

1.5.3 Sequencing and Scheduling

1.5.3.1 DALT and TAB Submittal and Work Schedule

Submit this schedule,and TAB Schematic Drawings, adapted for this particular contract, to the Contracting Officer (CO) for review and approval. Include with the submittal the planned calendar dates for each submittal or work item. Resubmit an updated version for CO approval every 90 calendar days days. Compliance with the following schedule is the Contractor's responsibility.

a. Qualify TAB Personnel: Within 45 calendar days after date of contract award, submit TAB agency and personnel qualifications.

b. Submit the DALT and TAB Work Execution Schedule: Within 14 days after receipt of the TAB agency and TAB personnel qualifications approval. Revise and re-submit this schedule 28 days prior to commencement of DALT work and 28 days prior to commencement of TAB. Submit the DALT and TAB Work Procedures Summary: Within 14 days after receipt of the initial approved DALT and TAB Work Execution Schedule.

c. Pre-DALT/TAB Meeting: Within 30 calendar days after the date of approval of the TAB agency and personnel, meet with the COTR.

d. Design Review Report: Within 60 calendar days after the date of the TAB agency personnel qualifications approval, submit design review report.

e. Advance Notice of Pre-Field DALT Preliminary Notification: On completion of the duct installation for each system, notify the Contracting Officer in writing within 5 days after completion.

f. DALT Field Work: Complete DALT field work within 4 days of the DALT Preliminary Notification.

g. Submit Pre-final DALT Report: Within one working day after completion of DALT field work, submit Pre-final DALT Report. Separate Pre-final DALT reports may be submitted to allow phased testing from system to system.

h. DALT Work Field Check: Upon approval of the Pre-final DALT Report, schedule the COTR's DALT field check work with the Contracting Officer.

i. Submit Final DALT Report: Within 15 calendar days after completion of successful DALT Work Field Check, submit TAB report.

j. Pre-Field TAB Engineering Report: Within 30 calendar days after approval of the TAB agency Personnel Qualifications, submit the Pre-Field TAB Engineering Report.

k. Prerequisite HVAC Work Check Out List and Advanced Notice For TAB Field Work: At a minimum of 115 calendar days prior to CCD, submit prerequisite HVAC work check out list certified as complete, and submit advance notice of commencement of TAB field work.

l. TAB Field Work: At a minimum of 90 calendar days prior to CCD, accomplish TAB field work; submit TAB report.

m. Submit TAB Report: Within 15 calendar days after completion of TAB field work, submit Pre-final TAB report.

n. TAB Field Check: 30 calendar days after TAB report is approved by the Contracting Officer, conduct field check.

o. Complete TAB Work: Prior to CCD, complete all TAB work.

1.5.4 Subcontractor Special Requirements

Perform all work in this section in accordance with the paragraph SUBCONTRACTOR SPECIAL REQUIREMENTS in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS, stating that all contract requirements of this section must be accomplished directly by a first tier subcontractor. No work may be performed by a second tier subcontractor.

1.5.5 Instrument Calibration Certificates

It is the responsibility of the TAB firm to provide instrumentation that meets the minimum requirements of the standard under which the TAB Firm's qualifications are approved for use on a project. Instrumentation must be in proper operating condition and must be applied in accordance with the instrumentation's manufacturer recommendations.

All instrumentation must bear a valid NIST traceable calibration certificate during field work and during government acceptance testing. All instrumentation must be calibrated within no later than one year of the date of TAB work or government acceptance testing field work.

1.6 WARRANTY

Furnish workmanship and performance warranty for the DALT and TAB system work performed for a period not less than 1 year from the date of Government acceptance of the work; issued directly to the Government. Include provisions that if within the warranty period the system shows evidence of major performance deterioration, or is significantly out of tolerance, resulting from defective TAB or DALT workmanship, the corrective repair or replacement of the defective materials and correction of the defective workmanship is the responsibility of the TAB firm. Perform corrective action that becomes necessary because of defective materials and workmanship while system TAB and DALT is under warranty 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time constitutes grounds for having the corrective action and repairs performed by others and the cost billed to the TAB firm. The Contractor must also provide a 1 year contractor installation warranty.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PRE-DALT/TAB MEETING

Meet with the Contracting Officer's technical representative (COTR) to develop a mutual understanding relative to the details of the DALT work and TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.2 DALT PROCEDURES

3.2.1 Instruments, Consumables and Personnel

Provide instruments, consumables and personnel required to accomplish the DALT field work. Follow the same basic procedure specified below for TAB Field Work, including maintenance and calibration of instruments, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.2.2 Advance Notice of Pre-Final DALT Field Work

On completion of the installation of each duct system indicated to be DALT'd, notify the Contracting Officer in writing prior to the COTR's duct selection field visit.

3.2.3 Ductwork To Be DALT'd

Leak test all ductwork.

3.2.4 DALT Testing

Use the duct class, seal class, leakage class and the leak test pressure data indicated on the drawings, to comply with the procedures specified in SMACNA 1972 CD.

3.2.5 Completed Pre-Final DALT Report

After completion of the DALT work, prepare a Pre-final DALT Report meeting the additional requirements specified in Appendix A REPORTS - DALT and TAB. Data required by those data report forms shall be furnished by the TAB team. Prepare the report neatly and legibly; the Pre-final DALT report shall provide the basis for the Final DALT Report.

TAB supervisor shall review, approve and sign the Pre-Final DALT Report and submit this report within one day of completion of DALT field work. Verbally notify the COTR that the field check of the Pre-Final DALT Report data can commence. After completion of the DALT work, prepare a Pre-final DALT Report using the reporting forms specified. TAB team to furnish data required by those data report forms. Prepare the report neatly and legibly; the Pre-final DALT report is the basis for the Final DALT Report.

3.2.6 Quality Assurance - COTR DALT Field Acceptance Testing

In the presence of the COTR and TAB team field leader, verify for accuracy Pre-final DALT Report data selected by the COTR. For each duct system, this acceptance testing shall be conducted on a maximum of 50 percent of

the duct sections DALT'd.

Further, if any data on the Pre-final DALT report form for a given duct section is out-of-tolerance, then field acceptance testing shall be conducted on data for one additional duct section, preferably in the same duct system, in the presence of the COTR.

3.2.7 Additional COTR Field Acceptance Testing

If any of the duct sections checked for a given system are determined to have a leakage rate measured that exceeds the leakage rate allowed by SMACNA Leak Test Manual for an indicated duct construction class and sealant class, terminate data checking for that section. The associated Pre-final DALT Report data for the given duct system will be disapproved. Make the necessary corrections and prepare a revised Pre-final DALT Report. Reschedule a field check of the revised report data with the COTR.

3.2.8 Certified Final DALT Report

On successful completion of all field checks of the Pre-Final DALT Report data for all systems, the TAB Supervisor shall assemble, review, approve, sign and submit the Final DALT Report in compliance with Appendix A REPORTS - DALT and TAB to the Contracting Officer for approval.

3.2.9 Prerequisite for TAB Field Work

Do not commence TAB field work prior to the completion and approval, for all systems, of the Final DALT Report.

3.3 TAB PROCEDURES

3.3.1 TAB Field Work

Test, adjust, and balance the HVAC systems until measured flow rates (air and water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents.

That is, comply with the requirements of AABC MN-1, NEBB PROCEDURAL STANDARDS, NEBB MASV, or SMACNA 1780 (TABB) and SMACNA 1858 (TABB), except as supplemented and modified by this section.

Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.2 Preliminary Procedures

Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. TAB engineer is to locate, in the field, test ports required for testing. It is the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

Advance Notice of TAB Field Work: At a minimum of 14 calendar days prior to TAB Field Work, submit advance notice of TAB field work.

3.3.3 TAB Air Distribution Systems

3.3.3.1 Units with Coils

Report heating and cooling performance capacity tests for hot water, DX coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

a. For air handlers with capacities greater than 7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, conduct capacity tests in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

    1. Do not determine entering and leaving wet and dry bulb temperatures by single point measurement, but by the average of multiple readings in compliance with paragraph 3.5-5, "Procedures," (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

    2. Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; use the data for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity vs. Design Capacity" (in subparagraph c.).

b. For units with capacities of 7.5 tons (90,000 Btu) or less, such as fan coil units, duct, and unitary units, such as through-the-wall:

    1. Determine the apparent coil capacity by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; submit the calculations with the coil reports.

3.3.3.2 Dedicated Outdoor Air Unit

Dedicated Outdoor Air Unit including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

For refrigeration compressors/condensers/condensing units/evaporators, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.3.3.3 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.

3.3.4 TAB Water Distribution Systems

3.3.4.1 Heating Hot Water

Heating hot water systems including boilers, CUHs, PTHPs, and UHs (e.g., heat exchangers), pumps, coils, system balancing valves and flow measuring devices.

3.3.4.2 Domestic Hot Water

Domestic hot water balancing valves and circulator pumps.

3.3.5 TAB Work

3.3.5.1 Performance Tests

In addition to the TAB proportionate balancing work on the air distribution systems and the water distribution systems, accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the heating systems and cooling systems.

3.3.5.2 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. Record these temperatures at beginning and at the end of data taking.

3.3.5.3 Refrigeration Units

For refrigeration compressors/condensers/condensing units, report data as required by NEBB Form TAB 15-83, NEBB PROCEDURAL STANDARDS, including refrigeration operational data.

3.3.5.4 Coils

Report heating and cooling performance capacity tests for hot water and DX for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

a. For Central station air handlers with capacities greater than 7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, conduct capacity tests in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

    1. Entering and leaving wet and dry bulb temperatures are not determined by single point measurement, but the average of multiple readings in compliance with paragraph 3.5-5, "Procedures," (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

    2. Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; use the data for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity vs. Design Capacity" (in subparagraph c.).

3.3.6 Workmanship

Conduct TAB work on the HVAC systems until measured flow rates are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. This TAB work includes adjustment of balancing valves, balancing dampers, and sheaves. Further, this TAB work includes changing out fan sheaves and pump impellers if required to obtain air and water flow rates specified or indicated. If, with these adjustments and equipment changes, the specified or indicated design flow rates cannot be attained, contact the Contracting Officer for direction.

3.3.7 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph WORKMANSHIP, provide written notice as soon as possible to the Contractor and the Contracting Officer describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB team supervisor's.

3.3.8 TAB Reports

Additional requirements for TAB Reports are specified in Appendix A REPORTS - DALT and TAB.

3.3.9 Quality Assurance - COTR TAB Field Acceptance Testing

3.3.9.1 TAB Field Acceptance Testing

During the field acceptance testing, verify, in the presence of the COTR, random selections of data (water, air quantities, air motion) recorded in the TAB Report. Points and areas for field acceptance testing are to be selected by the COTR. Measurement and test procedures are the same as approved for TAB work for the TAB Report.

Field acceptance testing includes verification of TAB Report data recorded for the following equipment groups:

a. Group 1: Dedicated outdoor air unit.

b. Group 2: 25 percent of the supply diffusers, registers, grilles associated with constant volume air handling units.

c. Group 3: 25 percent of the return grilles, return registers, exhaust grilles and exhaust registers.

d. Group 4: All pumps.

e. Group 5: 25 percent of CUH and PTHP units.

Further, if any data on the TAB Report for Groups 2 through 5 is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, additional group data verification is required in the presence of the COTR. Verify TAB Report data for one additional piece of equipment in that group. Continue this additional group data verification until out-of-tolerance data ceases to be found.

3.3.9.2 Additional COTR TAB Field Acceptance Testing

If any of the acceptance testing measurements for a given equipment group is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, terminate data verification for all affected data for that group. The affected data for the given group will be disapproved. Make the necessary corrections and prepare a revised TAB Report.

Reschedule acceptance testing of the revised report data with the COTR.

Further, if any data on the TAB Report for a given field acceptance test group is out-of-tolerance, then field test data for one additional field test group as specified herein. Continue this increase field test work until out-of-tolerance data ceases to to be found. This additional field testing is up and above the original 25 percent of the reported data entries to be field tested.

3.3.9.3 Prerequisite for Approval

Compliance with the field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB Report submitted.

3.4 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, gauges, splitters, and dampers so that adjustment can be restored if disturbed at any time. Provide permanent markings clearly indicating the settings on the adjustment devices which result in the data reported on the submitted TAB report.

3.5 MARKING OF TEST PORTS

The TAB team is to permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, make these markings on the exterior side of the duct insulation. Show the location of test ports on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

3.6 APPENDICES

Appendix A REPORTS - DALT and TAB

Appendix A

REPORTS - DALT and TAB

All submitted documentation must be typed, neat, and organized. All reports must have a waterproof front and back cover, a title page, a certification page, sequentially numbered pages throughout, and a table of contents. Tables, lists, and diagrams must be titled. Generate and submit for approval the following documentation:

a. DALT and TAB Work Execution Schedule:

Submit a detailed schedule indicating the anticipated calendar date for each submittal and each portion of work required under this section. For each work entry, indicate the support personnel (such as controls provider, HVAC mechanic, etc.) that are needed to accomplish the work. Arrange schedule entries chronologically.

b. DALT and TAB Procedures Summary:

Submit a detailed narrative describing all aspects of the DALT and TAB field work to be performed. Clearly distinguish between DALT information and TAB information. Include the following:

1. A list of the intended procedural steps for the DALT and TAB field work from start to finish. Indicate how each type of data measurement will be obtained. Include what Contractor support personnel are required for each step, and the tasks they need to perform.

2. A list of the project's submittals that are needed by the TAB Firm in order to meet this Contract's requirements.

3. The schematic drawings to be used in the required reports, which may include building floor plans, mechanical room plans, duct system plans, and equipment elevations. Indicate intended TAB measurement locations, including where test ports need to be provided by the Contractor.

4. The data presentation forms to be used in the report, with the preliminary information and initial design values filled in.

5. A list of DALT and TAB instruments to be used, edited for this project, to include the instrument name and description, manufacturer, model number, scale range, published accuracy, most recent calibration date, and what the instrument will be used for on this project.

6. A thorough checklist of the work items and inspections that need to be accomplished before DALT field work can be performed. The Contractor must complete, submit, and receive approval of the Completed Pre-Final DALT Work Checklist before DALT field work can be accomplished.

7. A thorough checklist of the work items and inspections that need to be accomplished before the TAB field work can be performed. The Contractor must complete, submit, and receive approval of the Completed Pre-TAB Work Checklist before the TAB field work can be

accomplished.

8. The checklists specified above shall be individually developed and tailored specifically for the work under this contract. Refer to NEBB PROCEDURAL STANDARDS, Section III, "Preliminary TAB Procedures" under the paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" for examples of items to include in the checklists.

c. Design Review Report:

Submit report containing the following information:

1. Review the contract specifications and drawings to verify that the TAB work can be successfully accomplished in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.

2. Submit a typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the DALT work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. If no deficiencies are evident, state so in the report.

d. Completed Pre-Final DALT Work Checklist:

Report the data for the Pre-Final DALT Report meeting the following requirements:

1. Submit a copy of the approved DALT and TAB Procedures Summary: Provide notations describing how actual field procedures differed from the procedures listed.

2. Report format: Submit a comprehensive report for the DALT field work data using data presentation forms equivalent to the "Air Duct Leakage Test Summary Report Forms" located in the SMACNA 1972 CD. In addition, submit in the report, a marked duct shop drawing which identifies each section of duct tested with assigned node numbers for each section. Node numbers shall be included in the completed report forms to identify each duct section.

3. Calculations: Include a copy of all calculations prepared in determining the duct surface area of each duct test section. Include in the DALT reports copy(s) of the calibration curve for each of the DALT test orifices used for testing.

4. Instruments: List the types of instruments actually used to measure the data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instruments are to be calibrated within one year of the date of use in the field; instrument calibration is to be traceable to the measuring standards of the National Institute of Standards and Technology.

5. TAB Supervisor Approval: Include on the submitted report the

typed name of the TAB supervisor and the dated signature of the TAB supervisor.

e. Final DALT Report:

On successful completion of all COTR field checks of the Pre-final DALT Report data for all systems, the TABS Supervisor shall assemble, review, sign and submit the Final DALT Report to the Contracting Officer for approval.

f. TAB Reports: Submit TAB Report in the following manner:

1. Procedure Summary: Submit a copy of the approved DALT and TAB Procedures Summary. When applicable, provide notations describing how actual field procedures differed from the procedures listed.

2. Report format: Submit the completed data forms approved in the TAB pre-field Engineering Report completed by TAB field team, reviewed, approved and signed by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

3. Air System Diagrams: Provided updated diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations.

4. Air Static Pressure Profiles: Report static pressure profiles for air duct systems including: DOAS-1. Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. The static pressure report data shall include, in addition to AABC or NEBB or TABB required data, the following:

(a) Report supply fan and exhaust fan inlet and discharge static pressures.

(b) Report static pressure drop across DX coils, hot water coils, and heat reclaim devices installed in unit cabinetry or the system ductwork.

(c) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry.

(d) Report static pressure drop across air filters, air flow straighteners, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

(1) Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.

(e) Report static pressure drop across outside air and relief/exhaust air louvers.

(f) Report static pressure readings of supply air, return air, exhaust/relief air, and outside air in duct at the point where these ducts connect to each air moving unit.

5. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

   (a) Instrumentation, used for taking wet bulb temperature readings shall provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

6. Performance Curves: The TAB Supervisor shall include, in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.

7. Calibration Curves: The TAB Supervisor shall include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturis and flow orifices TAB'd on the job.

8. Data From TAB Field Work: After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and approval signature, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph WORKMANSHIP.

-- End of Section --

SECTION 23 07 00

THERMAL INSULATION FOR MECHANICAL SYSTEMS
02/13

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to ensure compliance with the standard or standards referenced in this specification.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013; INT 1 2013; Errata 1-3 2013; Errata 4-6 2014; Errata 7-8 2015; INT 2-3 2015) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A580/A580M	(2015) Standard Specification for Stainless Steel Wire
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C1136	(2012) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C1710	(2011) Standard Guide for Installation of Flexible Closed Cell Preformed Insulation in Tube and Sheet Form
ASTM C450	(2008) Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging
ASTM C534/C534M	(2014) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C547	(2015) Standard Specification for Mineral Fiber Pipe Insulation

ASTM C795	(2008; R 2013) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM E2231	(2015) Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds	(1999) National Commercial & Industrial Insulation Standards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 90B	(2015) Standard for the Installation of Warm Air Heating and Air Conditioning Systems

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-24179	(1969; Rev A; Am 2 1980; Notice 1 1987) Adhesive, Flexible Unicellular-Plastic Thermal Insulation
MIL-A-3316	(1987; Rev C; Am 2 1990) Adhesives, Fire-Resistant, Thermal Insulation

UNDERWRITERS LABORATORIES (UL)

UL 723	(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials

UL 94 (2013; Reprint Jul 2015) Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

1.2 SYSTEM DESCRIPTION

1.2.1 General

Provide field-applied insulation and accessories on mechanical systems as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

1.2.2 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the materials meet all other requirements of this section. The minimum recycled material content of the following insulation are:

Rock Wool	75 percent slag of weight
Fiberglass	20-25 percent glass cullet by weight
Rigid Foam	9 percent recovered material

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Submit the three SD types, SD-02 Shop Drawings, SD-03 Product Data, and SD-08 Manufacturer's Instructions at the same time for each system.

SD-02 Shop Drawings

Pipe Insulation Systems and Associated Accessories; G

Duct Insulation Systems and Associated Accessories; G

SD-03 Product Data

Pipe Insulation Systems; G

Duct Insulation Systems; G

Equipment Insulation Systems; G

SD-08 Manufacturer's Instructions

Pipe Insulation Systems

Duct Insulation Systems

1.4 QUALITY ASSURANCE

1.4.1 Installer Qualification

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material, date codes, and approximate shelf life (if applicable). Insulation packages and containers shall be asbestos free.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit a complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories including adhesives, sealants and jackets for each mechanical system requiring insulation shall be included. The product data must be copyrighted, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation.

2.1.1 Insulation System

Provide insulation systems in accordance with the approved MICA National Insulation Standards plates as supplemented by this specification. Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems that are located within, on, under, and adjacent to buildings; and for plumbing systems. Provide CFC and HCFC free insulation.

2.1.2 Surface Burning Characteristics

Unless otherwise specified, insulation must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flame spread, and smoke developed indexes shall be determined by ASTM E84 or UL 723. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Prepare and mount test specimens according to ASTM E2231.

2.2 MATERIALS

Provide insulation that meets or exceed the requirements of ASHRAE 90.1 - IP. Insulation exterior shall be cleanable, grease

resistant, non-flaking and non-peeling. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C795 requirements. Calcium silicate shall not be used on chilled or cold water systems. Materials shall be asbestos free. Provide product recognized under UL 94 (if containing plastic) and listed in FM APP GUIDE.

2.2.1 Adhesives

2.2.1.1 Lagging Adhesive

Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Adhesive shall be MIL-A-3316, Class 1, pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.2.1.2 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Flexible Elastomeric Adhesive: Comply with MIL-A-24179, Type II, Class I. Provide product listed in FM APP GUIDE.

2.2.2 Caulking

ASTM C920, Type S, Grade NS, Class 25, Use A.

2.2.3 Corner Angles

Nominal 0.016 inch aluminum 1 by 1 inch with factory applied kraft backing. Aluminum shall be ASTM B209, Alloy 3003, 3105, or 5005.

2.2.4 Fittings

Fabricated Fittings are the prefabricated fittings for flexible elastomeric pipe insulation systems in accordance with ASTM C1710. Together with the flexible elastomeric tubes, they provide complete system integrity for retarding heat gain and controlling condensation drip from chilled-water and refrigeration systems. Flexible elastomeric, fabricated fittings provide thermal protection (0.25 k) and condensation resistance (0.05 Water Vapor Transmission factor). For satisfactory performance, properly installed protective vapor retarder/barriers and vapor stops

shall be used on high relative humidity and below ambient temperature applications to reduce movement of moisture through or around the insulation to the colder interior surface.

2.2.5 Finishing Cement

ASTM C450: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with ASTM C795.

2.2.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20 by 20 maximum mesh size, and glass tape shall have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Tape shall be 4 inch wide rolls. Class 3 tape shall be 4.5 ounces/square yard. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing an anti-microbial additive.

2.2.7 Staples

Outward clinching type ASTM A167, Type 304 or 316 stainless steel.

2.2.8 Jackets

2.2.8.1 Aluminum Jackets

Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inches and larger diameter. Aluminum jacket circumferential seam bands shall be 2 by 0.016 inch aluminum matching jacket material. Bands for insulation below ground shall be 3/4 by 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place.

2.2.8.2 Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, ultraviolet (UV) resistant rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

2.2.9 Vapor Barriers

2.2.9.1 Vapor Barrier

The vapor barrier shall be greater than 3 ply self adhesive laminate-white vapor barrier jacket (0.0000 permeability when tested in accordance with ASTM E96/E96M). Vapor barrier shall meet UL 723 or ASTM E84 25 flame and 50 smoke requirements; and UV resistant.

2.2.10 Wire

Soft annealed ASTM A580/A580M Type 302, 304 or 316 stainless steel, 16 or

18 gauge.

2.2.11 Insulation Bands

Insulation bands shall be 1/2 inch wide; 26 gauge stainless steel.

2.2.12 Sealants

Sealants shall be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants shall have a maximum permeance of 0.02 perms based on Procedure B for ASTM E96/E96M, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.3 PIPE INSULATION SYSTEMS

Conform insulation materials to Table 1 and minimum insulation thickness as listed in Table 2 and meet or exceed the requirements of ASHRAE 90.1 - IP. Limit pipe insulation materials to those listed herein and meeting the following requirements:

2.3.1 Aboveground Cold Pipeline (-30 to 60 deg. F)

Insulation for outdoor, indoor, exposed or concealed applications shall be as follows:

2.3.1.1 Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with ASTM C534/C534M, Grade 1, Type I or II. Type I, Grade 1 for tubular materials. Type II, Grade 1, for sheet materials. Type I and II shall have vapor retarder/vapor barrier skin on one or both sides of the insulation, and require an additional exterior vapor retarder covering for high relative humidity and below ambient temperature applications.

2.3.2 Aboveground Hot Pipeline (Above 60 deg. F)

Insulation for outdoor, indoor, exposed or concealed applications shall meet the following requirements. Supply the insulation with manufacturer's recommended factory-applied jacket/vapor barrier.

2.3.2.1 Mineral Fiber

ASTM C547, Types I, II or III, supply the insulation with manufacturer's recommended factory-applied jacket.

2.4 DUCT INSULATION SYSTEMS

2.4.1 Factory-Applied Insulation

2.4.1.1 Rigid Insulation

Calculate the minimum thickness in accordance with ASHRAE 90.1 - IP.

2.4.1.2 Blanket Insulation

Calculate minimum thickness in accordance with ASHRAE 90.1 - IP.

2.4.2 Duct Insulation Jackets

2.4.2.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jacket with a white surface suitable for field painting.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation shall only be applied to unheated and uncooled piping and equipment. Flexible elastomeric cellular insulation shall not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour shall be replaced.

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the job site. Joints shall be staggered on multilayer insulation. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where pipes and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials. The protection of ducts at point of passage through firewalls must be in accordance with NFPA 90A and/or NFPA 90B. All other penetrations, such as piping, conduit, and wiring, through firewalls must be protected with a material or system of the same hourly rating that is listed by UL, FM, or an NRTL.

3.1.3 Installation of Flexible Elastomeric Cellular Insulation

Install flexible elastomeric cellular insulation with seams and joints sealed with rubberized contact adhesive. Flexible elastomeric cellular insulation shall not be used on surfaces greater than 220 degrees F. Stagger seams when applying multiple layers of insulation. Protect insulation exposed to weather and not shown to have vapor barrier weatherproof jacketing with two coats of UV resistant finish or PVC or metal jacketing as recommended by the manufacturer after the adhesive is dry and cured.

3.1.3.1 Adhesive Application

Apply a brush coating of adhesive to both butt ends to be joined and to both slit surfaces to be sealed. Allow the adhesive to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Insulation that can be pulled apart one hour after installation shall be replaced.

3.1.3.2 Adhesive Safety Precautions

Use natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

3.1.4 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

3.1.5 Pipes/Ducts That Require Insulation

Insulation is required on all pipes and ducts, except for omitted items as specified.

3.2 PIPE INSULATION SYSTEMS INSTALLATION

Install pipe insulation systems in accordance with the approved MICA Insulation Stds plates as supplemented by the manufacturer's published installation instructions.

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder/barrier, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

a. Pipe used solely for fire protection.

b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.

c. Sanitary drain lines.

d. ASME stamps.

e. Cleanouts or handholes.

3.2.1.2 Pipes Passing through Walls, Roofs, and Floors

Pipe insulation shall be continuous through the sleeve.

Provide an aluminum jacket or vapor barrier jacket over the insulation wherever penetrations require sealing.

a. Penetrate Interior Walls:

The aluminum jacket or vapor barrier jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.

b. Penetrating Floors:

Extend the aluminum jacket from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.

c. Penetrating Roofs:

Insulate pipe as required for interior service to a point flush with the top of the flashing and sealed with flashing sealant. Tightly butt the insulation for exterior application to the top of flashing and interior insulation. Extend the exterior aluminum jacket 2 inches down beyond the end of the insulation to form a counter flashing. Seal the flashing and counter-flashing underneath with metal jacketing/flashing sealant.

d. Hot Water Pipes Supplying Lavatories or Other Similar Heated Service:

Terminate the insulation on the backside of the finished wall. Protect the insulation termination with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch applied with glass tape embedded between coats (if applicable). Extend the coating out onto the insulation 2 inches and seal the end of the insulation. Overlap glass tape seams 1 inch. Caulk the annular space between the pipe and wall penetration with approved fire stop material. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration at least 3/8 inch.

e. Domestic Cold Water Pipes Supplying Lavatories or Other Similar Cooling Service:

Terminate the insulation on the finished side of the wall (i.e., insulation must cover the pipe throughout the wall penetration). Protect the insulation with two coats of weather barrier mastic (breather emulsion type weatherproof mastic impermeable to water and permeable to air) with a minimum total thickness of 1/16 inch. Extend the mastic out onto the insulation 2 inches and shall seal the end of the insulation. The annular space between the outer surface of the pipe insulation and caulk the wall penetration with an approved fire stop material having vapor retarder properties. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration by at least 3/8 inch.

3.2.1.3 Pipes Passing through Hangers

Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the

insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed, or factory insulated hangers (designed with a load bearing core) can be used.

a. Horizontal Pipes Larger than 2 Inches at 60 Degrees F and Above:

Supported on hangers in accordance with MSS SP-69, and Section 22 00 00 PLUMBING, GENERAL PURPOSE.

b. Horizontal Pipes Larger than 2 Inches and Below 60 Degrees F:

Supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-69. An insulation insert of cellular glass, prefabricated insulation pipe hangers, or perlite above 80 degrees F shall be installed above each shield. The insert shall cover not less than the bottom 180-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

c. Vertical Pipes:

Supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360-degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe that are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

d. Inserts:

Covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, overlap the adjoining pipe jacket 1-1/2 inches, and seal as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation shall conform to ASTM C1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation shall be tubular form for pipe sizes 6 inches and less. Grade 1, Type II sheet insulation used on pipes larger than 6 inches shall not be stretched around the pipe. Sweat fittings shall be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation. Type II requires an additional exterior vapor retarder/barrier covering for high relative humidity and below ambient temperature applications.

3.2.1.5 Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1 and must meet or exceed the requirements of ASHRAE 90.1 - IP.

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VB Req'd
Heating Hot Water Supply & Return (Max 250 F)					
	Mineral Fiber	ASTM C547	I	1	No
Cold Domestic Water Piping, Makeup Water & Drinking Fountain Drain Piping					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Hot Domestic Water Supply & Recirculating Piping (Max 200 F)					
	Mineral Fiber	ASTM C547	I	1	No
Refrigerant Suction Piping (35 degrees F nominal)					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicapped Personnel					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Condensate Drain Located Inside Building					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Note: VB = Vapor Barrier					

TABLE 2						
Piping Insulation Thickness (inch)						
Service						
	Material	Tube and Pipe Size (inch)				
		<1	1-<1.5	1.5-<4	4-<8	> or = >8
Cold Domestic Water Piping, Makeup Water & Drinking Fountain Drain Piping						
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A
Refrigerant Suction Piping (35 degrees F nominal)						
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A
Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicapped Personnel						
	Flexible Elastomeric Cellular	0.5	0.5	0.5	0.5	0.5
Condensate Drain Located Inside Building						
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 30 to plus 60 degrees F shall be insulated. This includes but is not limited to the following:

a. Make-up water.

b. Horizontal and vertical portions of interior roof drains.

c. Refrigerant suction lines.

d. Air conditioner condensate drains.

e. Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap persons.

3.2.2.1 Factory- or Field-applied Jacket

Insulation shall be covered with a factory-applied vapor barrier or field-applied seal-welded PVC jacket or laminated self-adhesive vapor barrier jacket. Insulation inside the building is to be protected with an aluminum jacket or vapor barrier. The aluminum jacket or vapor barrier shall be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required.

3.2.2.2 Installing Insulation for Straight Runs Hot and Cold Pipe

Apply insulation to the pipe with tight butt joints. Seal all butted joints and ends with joint sealant and seal with a vapor retarder coating.

a. Longitudinal Laps of the Jacket Material:

1. Overlap not less than 1-1/2 inches. Provide butt strips 3 inches wide for circumferential joints.

b. Laps and Butt Strips:

1. Secure with adhesive and staple on 4 inch centers if not factory self-sealing. If staples are used, seal in accordance with paragraph STAPLES below.

c. Factory Self-Sealing Lap Systems:

1. May be used when the ambient temperature is between 40 and 120 degrees F during installation. Install the lap system in accordance with manufacturer's recommendations. Use a stapler only if specifically recommended by the manufacturer. Where gaps occur, replace the section or repair the gap by applying adhesive under the lap and then stapling.

d. Staples:

1. Coat all staples, including those used to repair factory self-seal lap systems, with a vapor retarder coating. Coat all seams, except those on factory self-seal systems, with vapor retarder coating or PVDC adhesive tape.

e. Breaks and Punctures in the Jacket Material:

1. Patch by wrapping a strip of jacket material around the pipe and secure it with adhesive, staple, and coat with vapor retarder coating. Extend the patch not less than 1-1/2 inches past the break.

f. Penetrations Such as Thermometers:

1. Fill the voids in the insulation and seal with vapor retarder coating.

g. Flexible Elastomeric Cellular Pipe Insulation:

1. Install by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. Secure all seams and butt joints and seal with adhesive. When using self seal products only the butt joints shall be secured with adhesive. Push insulation on the pipe, never pulled. Stretching of insulation may result in open seams and joints. Clean cut all edges. Rough or jagged edges of the insulation are not be permitted. Use proper tools. Do not stretch Grade 1, Type II sheet insulation around the pipe when used on pipe larger than 6 inches.

3.2.2.3 Insulation for Fittings and Accessories

a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant and sealed with a vapor retarder coating.

b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow."

c. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with two coats of vapor retarder coating with a minimum total thickness of 1/16 inch, applied with glass tape embedded between coats. The coating shall extend out onto the adjoining pipe insulation 2 inches. Fabricated insulation with a factory vapor retarder jacket shall be protected with two coats of vapor retarder coating with a minimum thickness of 1/16 inch and with a 2 inch wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, the joints shall be sealed with a vapor retarder coating and a 4 inch wide ASJ tape which matches the jacket of the pipe insulation.

d. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.

e. Insulation shall be marked showing the location of unions, strainers, and check valves.

3.2.2.4 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments shall be used under the fitting covers for elbows. Insulation segments shall be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers shall be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, shall be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal.

3.2.3 Aboveground Hot Pipelines

3.2.3.1 General Requirements

All hot pipe lines above 60 degrees F shall be insulated. This includes but is not limited to the following:

a. Domestic hot water supply.

b. Hot water heating.

3.2.3.2 Insulation for Fittings and Accessories

Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant. Insulation shall be marked showing the location of unions, strainers, check valves and other components that would otherwise be hidden from view by the insulation.

a. Precut or Preformed:

Place precut or preformed insulation around all fittings and accessories. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity.

b. Rigid Preformed:

Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow."

3.2.4 Piping Exposed to Weather

3.2.4.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 60 degrees F and below shall be sealed with metal jacketing/flashing sealant while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and below abuts an un-insulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture retarder.

3.2.4.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of mastic recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches.

3.3 DUCT INSULATION SYSTEMS INSTALLATION

Install duct insulation systems in accordance with the approved MICA Insulation Stds plates as supplemented by the manufacturer's published installation instructions. Duct insulation minimum thickness and insulation level must meet or exceed the requirements of ASHRAE 90.1 - IP.

3.3.1 Insulation and Vapor Barrier for Duct

Insulation and vapor barrier shall be provided for the following air ducts and associated equipment.

a. Supply ducts.

b. Return air ducts.

c. Plenums.

d. Fresh air intake ducts.

Insulation for all exposed ducts shall be provided with either a white, paintable, factory-applied Type I jacket or a field-applied vapor retarder/vapor barrier jacket coating finish as specified, the total field-applied dry film thickness shall be approximately 1/16 inch. Insulation on all concealed duct shall be provided with a factory-applied Type I or II vapor retarder/vapor barrier jacket. Duct insulation shall be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder/vapor barrier shall cover the collar, neck, and any un-insulated surfaces of diffusers, registers and grills. Vapor retarder/vapor barrier materials shall be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct shall be sealed in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

3.3.1.1 Installation on Duct Work

a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches. Mechanical fasteners shall be as corrosion resistant as G60 coated galvanized steel, and shall indefinitely sustain a 50 pound tensile dead load test perpendicular to the duct wall.

b. Form duct insulation with minimum jacket seams. Fasten each piece of rigid insulation to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder/barrier jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors.

c. Impale insulation on the fasteners; self-locking washers shall be installed and the pin trimmed and bent over.

d. Seal joints in the insulation jacket with a 4 inch wide strip of tape. Seal taped seams with a brush coat of vapor retarder coating.

e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.

f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a flashing sealant.

g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

h. Oval and round ducts, flexible type, attached as in accordance with MICA standards.

3.3.2 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

3.4 EQUIPMENT INSULATION SYSTEMS INSTALLATION

Install equipment insulation systems in accordance with the approved MICA Insulation Stds plates as supplemented by the manufacturer's published installation instructions.

3.4.1 General

Removable insulation sections shall be provided to cover parts of equipment that must be opened periodically for maintenance including vessel covers, fasteners, flanges and accessories. Equipment insulation shall be omitted on the following:

a. Manufacturer's nameplates.

3.4.2 Insulation for Hot Equipment

Insulation shall be furnished on equipment handling media above 60 degrees F including the following:

a. Pumps handling media above 130 degrees F.

3.4.2.1 Insulation

Insulation shall be rigid mineral fiber. Insulation thickness for hot equipment shall be 2 inches.

3.4.2.2 Insulation of Pumps

Insulate pumps by forming a box around the pump housing. The box shall be constructed by forming the bottom and sides using joints that do not leave raw ends of insulation exposed. Bottom and sides shall be banded to form a rigid housing that does not rest on the pump. Joints between top cover and sides shall fit tightly. The top cover shall have a joint forming a female shiplap joint on the side pieces and a male joint on the top cover, making the top cover removable. Two coats of Class I adhesive shall be applied over insulation, including removable sections, with a layer of glass cloth embedded between the coats. A parting line shall be provided

between the box and the removable sections allowing the removable sections to be removed without disturbing the insulation coating. The total dry thickness of the finish shall be 1/16 inch. Caulking shall be applied to parting line of the removable sections and penetrations.

-- End of Section --

SECTION 23 09 23.13 20

BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 135	(2012; Addenda AR 2013; Errata 1 2013; INT 1-9 2013; Errata 2 2013; INT 10-12 2014; Errata 3-4 2014; Addenda AI-AY 2014; INT 13-17 2015; Errata 5 2015) BACnet—A Data Communication Protocol for Building Automation and Control Networks
ASHRAE 135.1	(Errata 1 2015; INT 1 2013; Addenda O 2014) Method of Test for Conformance to BACnet

ARCNET TRADE ASSOCIATION (ATA)

ATA 878.1	(1999) Local Area Network: Token Bus

ASME INTERNATIONAL (ASME)

ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B31.1	(2014; INT 1-47) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A126	(2004; R 2014) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.45	(2002; R 2008) Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000v and less)AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1449	(2014;Reprint Mar 2015) Surge Protective Devices
UL 506	(2008; Reprint Oct 2013) Specialty Transformers
UL 508A	(2013; Reprint Jan 2014) Industrial Control Panels
UL 916	(2007; Reprint Aug 2014) Standard for Energy Management Equipment

1.2 DEFINITIONS

1.2.1 ANSI/ASHRAE Standard 135

ANSI/ASHRAE Standard 135: BACnet - A Data Communication Protocol for Building Automation and Control Networks, referred to as "BACnet." ASHRAE developed BACnet to provide a method for diverse building automation devices to communicate and share data over a network.

1.2.2 ARCNET

ATA 878.1 - Attached Resource Computer Network. ARCNET is a deterministic LAN technology; meaning it's possible to determine the maximum delay before a device is able to transmit a message.

1.2.3 BACnet

Building Automation and Control Network; the common name for the communication standard ASHRAE 135. The standard defines methods and protocol for cooperating building automation devices to communicate over a variety of LAN technologies.

1.2.4 BACnet/IP

An extension of BACnet, Annex J, defines this mechanism using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number. See also "BACnet Broadcast Management Device."

1.2.5 BACnet Internetwork

Two or more BACnet networks, possibly using different LAN technologies, connected with routers. In a BACnet internetwork, there exists only one

message path between devices.

1.2.6 BACnet Network

One or more BACnet segments that have the same network address and are interconnected by bridges at the physical and data link layers.

1.2.7 BACnet Segment

One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.

1.2.8 BBMD

BACnet Broadcast Management Device (BBMD). A communications device, typically combined with a BACnet router. A BBMD forwards BACnet broadcast messages to BACnet/IP devices and other BBMDs connected to the same BACnet/IP network. Every IP subnetwork that is part of a BACnet/IP network must have only one BBMD. See also "BACnet/IP."

1.2.9 BI

BACnet International, formerly two organizations: The BACnet Manufacturers Association (BMA) and the BACnet Interest Group - North America (BIG-NA).

1.2.10 BI/BTL

BACnet International/BACnet Testing Laboratories (Formerly BMA/BTL). The organization responsible for testing products for compliance with the BACnet standard, operated under the direction of BACnet International.

1.2.11 Device

Any control system component, usually a digital controller, that contains a BACnet Device Object and uses BACnet to communicate with other devices. See also "Digital Controller."

1.2.12 Device Object

Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device. Every Device Object requires a unique Object Identifier number on the BACnet internetwork. This number is often referred to as the device instance.

1.2.13 Device Profile

A collection of BIBBs determining minimum BACnet capabilities of a device, defined in ASHRAE Standard 135-2004, Annex L. BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS). Each device used in new construction is required to have a PICS statement listing BIBBs supported.

1.2.14 Digital Controller

An electronic controller, usually with internal programming logic and digital and analog input/output capability, which performs control functions. In most cases, synonymous with a BACnet device described in

this specification. See also "Device."

1.2.15 Direct Digital Control (DDC)

Digital controllers performing control logic. Usually the controller directly senses physical values, makes control decisions with internal programs, and outputs control signals to directly operate switches, valves, dampers, and motor controllers.

1.2.16 DDC System

A network of digital controllers, communication architecture, and user interfaces. A DDC system may include programming, sensors, actuators, switches, relays, factory controls, operator workstations, and various other devices, components, and attributes.

1.2.17 Ethernet

A family of local-area-network technologies providing high-speed networking features over various media.

1.2.18 Input/Output (I/O)

Physical inputs and outputs to and from a device, although the term sometimes describes software, or "virtual" I/O. See also "Points."

1.2.19 Native BACnet Device

A device that uses BACnet as its primary, if not only, method of communication with other BACnet devices without intermediary gateways. A system that uses native BACnet devices at all levels is a native BACnet system.

1.2.20 Object

The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.

1.2.21 Object Identifier

An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.

1.2.22 Object Properties

Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in ASHRAE 135; some are optional and some are required. Objects are controlled by reading from and writing to object properties.

1.2.23 Performance Verification Test (PVT)

The procedure for determining if the installed BAS meets design criteria prior to final acceptance. The PVT is performed after installation, testing, and balancing of mechanical systems. Typically the PVT is performed by the Contractor in the presence of the Government.

1.2.24 PID

Proportional, integral, and derivative control; three parameters used to control modulating equipment to maintain a setpoint. Derivative control is often not required for HVAC systems (leaving "PI" control).

1.2.25 PICS

Protocol Implementation Conformance Statement (PICS), describing the BACnet capabilities of a device. See BACnet, Annex A for the standard format and content of a PICS statement.

1.2.26 Points

Physical and virtual inputs and outputs. See also "Input/Output."

1.2.27 Stand-Alone Control

Refers to devices performing equipment-specific and small system control without communication to other devices or computers for physical I/O, excluding outside air and other common shared conditions. Devices are located near controlled equipment, with physical input and output points limited to 64 or less per device, except for complex individual equipment or systems. Failure of any single device or communications will not cause other network devices to fail. Internal time clocks and onboard scheduling are required to allow for stand-alone control. BACnet "Smart" actuators (B-SA profile) and sensors (B-SS profile) communicating on a network with a parent device are exempt from stand-alone requirements. Provide stand-alone control routines to provide for energy saving sequences such as free cooling. Provide stand-alone control routines that operate without connection to the BACnet/IP and MS/TP networks during a loss of communication.

1.3 SUBCONTRACTOR SPECIAL REQUIREMENTS

Perform all work in this section in accordance with the paragraph SUBCONTRACTOR SPECIAL REQUIREMENTS in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS. The paragraph specifies that all contract requirements of this section shall be accomplished directly by a first tier subcontractor. No work required shall be accomplished by a second tier subcontractor.

1.4 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC DESCRIPTION

a. New boiler plant and dedicated outdoor air unit controls shall be standalone but shall be compatible with existing Johnson Controls, Inc. (JCI) Metasys Extended Architecture and Advanced Graphics base-wide DDC energy control network and JCI ADX server. New controllers shall also have the capability of being shutdown or have setpoint adjusted remotely if they are connected in the future through the basewide demand limiting program via the ADX server.

   Dedicated outdoor air unit shall be capable of being shutdown for anti-terrorism/force protection (AT/FP) requirements. Manufacturer's products, including design, materials, fabrication, assembly, inspection, and testing shall be in accordance with ASHRAE 135, ASME B31.1, and NFPA 70, except where indicated otherwise.

1.4.1 Design Requirements

1.4.1.1 Control System Drawings Title Sheet

Provide a title sheet for the control system drawing set. Include the project title, project location, contract number, the controls contractor preparing the drawings, an index of the control drawings in the set, and a legend of the symbols and abbreviations used throughout the control system drawings.

1.4.1.2 List of I/O Points

Also known as a Point Schedule, provide for each input and output point physically connected to a digital controller: Point name, point description, point type (Analog Output (AO), Analog Input (AI), Binary Output (BO), Binary Input (BI)), point sensor range, point actuator range, point address, BACnet object, associated BIBBS (where applicable), and point connection terminal number. Typical schedules for multiple identical equipment are allowed unless otherwise requested in design or contract criteria.

1.4.1.3 Control System Components List

Provide a complete list of control system components installed on this project. Include for each controller and device: Control system schematic name, control system schematic designation, device description, manufacturer, model, part number, firmware version, serial number, and physical location (e.g., Building 4, room 112 overhead). For sensors, include point name, sensor range, and operating limits. For valves, include body style, Cv, design flow rate, pressure drop, valve characteristic (linear or equal percentage), and pipe connection size. For actuators, include point name, spring or non-spring return, modulating or two-position action, normal (power fail) position, nominal control signal operating range (0-10 volts DC or 4-20 milliamps), and operating limits.

1.4.1.4 Control System Schematics

Provide control system schematics. Typical schematics for multiple identical equipment are allowed unless otherwise requested in design or contract criteria. Include the following:

a. Location of each input and output device

b. Flow diagram for each piece of HVAC equipment

c. Name or symbol for each control system component, such as V-1 for a valve

d. Setpoints, with differential or proportional band values

e. Written sequence of operation for the HVAC equipment

f. Valve and Damper Schedules, with normal (power fail) position

1.4.1.5 Component Wiring Diagrams

Provide a wiring diagram for each type of input device and output device. Indicate how each device is wired and powered; showing typical connections

at the digital controller and power supply. Show for all field connected devices such as control relays, motor starters, actuators, sensors, and transmitters.

1.4.1.6 Terminal Strip Diagrams

Provide a diagram of each terminal strip. Indicate the terminal strip location, termination numbers, and associated point names.

1.5 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item listed, that clearly show compliance with the project specifications.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Include the following in the project's control system drawing set:

Control System Drawings Title Sheet

List of I/O Points

Control System Components List

Control System Schematics; G

Component Wiring Diagrams

Terminal Strip Diagrams

SD-03 Product Data

Direct Digital Controllers; G

Include BACnet PICS for each controller/device type, including smart sensors (B-SS) and smart actuators (B-SA).

Sensors and Input Hardware

Output Hardware

Surge and Transient Protection

SD-05 Design Data

Performance Verification Testing Plan

Pre-Performance Verification Testing Checklist

SD-06 Test Reports

Performance Verification Testing Report

SD-07 Certificates

Contractor's Qualifications; G

SD-09 Manufacturer's Field Reports

Pre-PVT Checklist

SD-10 Operation and Maintenance Data

Comply with requirements for data packages in Section 01 78 23 OPERATION AND MAINTENANCE DATA, except as supplemented and modified in this specification.

BACnet Direct Digital Control Systems, Data Package 4

SD-11 Closeout Submittals

Training Documentation

1.6 QUALITY ASSURANCE

1.6.1 Standard Products

Provide material and equipment that are standard manufacturer's products currently in production and supported by a local service organization.

1.6.2 Delivery, Storage, and Handling

Handle, store, and protect equipment and materials to prevent damage before and during installation according to manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.6.3 Operating Environment

Protect components from humidity and temperature variation, dust, and contaminants. If components are stored before installation, keep them within the manufacturer's limits.

1.6.4 Finish of New Equipment

New equipment finishing shall be factory provided. Manufacturer's standard factory finishing shall be proven to withstand 125 hours in a salt-spray fog test. Equipment located outdoors shall be proven to withstand 500 hours in a salt-spray fog test.

Salt-spray fog test shall be according to ASTM B117, with acceptance criteria as follows: Immediately after completion of the test, the finish shall show no signs of degradation or loss of adhesion beyond 0.125 inch on either side of the scratch mark.

1.6.5 Verification of Dimensions

The contractor shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing work.

1.6.6 Contractor's Qualifications

Submit documentation certifying the controls Contractor performing the

work has completed at least three DDC systems installations of a similar design to this project, and programmed similar sequences of operation for at least two years.

1.6.7 Modification of References

The advisory provisions in ASME B31.1 and NFPA 70 are mandatory. Substitute "shall" for "should" wherever it appears and interpret all references to the "authority having jurisdiction" and "owner" to mean the Contracting Officer.

1.6.8 Project Sequence

The control system work for this project shall proceed in the following order:

a. Submit and receive approval on the Shop Drawings, Product Data, and Certificates specified under the paragraph SUBMITTALS.

b. Perform the control system installation work, including all field check-outs and tuning.

c. Provide support to TAB personnel as specified under the paragraph TEST AND BALANCE SUPPORT.

d. Submit and receive approval of the Controls System Operators Manual specified under the paragraph CONTROLS SYSTEM OPERATORS MANUALS.

e. Submit and receive approval of the Performance Verification Testing Plan and the Pre-PVT Checklist specified under the paragraph PERFORMANCE VERIFICATION TESTING.

f. Perform the Performance Verification Testing.

g. Submit and receive approval on the PVT Report.

h. Submit and receive approval on the Training Documentation specified under the paragraph INSTRUCTION TO GOVERNMENT PERSONNEL. Submit at least 30 days before training.

i. Deliver the final Controls System Operators Manuals.

j. Conduct the Phase I Training.

k. Conduct the Phase II Training.

l. Submit and receive approval of Closeout Submittals.

PART 2 PRODUCTS

2.1 DDC SYSTEM

a. Provide a networked DDC system for stand-alone control in compliance with the latest revision of the ASHRAE 135 BACnet standard. Include all programming, objects, and services required to meet the sequence of control. Provide BACnet communications between the DDC system and native BACnet devices furnished with HVAC equipment. Devices provided shall be certified in the BACnet Testing Laboratories (BTL) Product Listing and in accordance with ASHRAE 135.1 Method of Test for

Conformance to BACnet.

2.1.1 Direct Digital Controllers

Direct digital controllers shall be UL 916 rated.

2.1.1.1 I/O Point Limitation

The total number of I/O hardware points used by a single stand-alone digital controller, including I/O expansion units, shall not exceed 64, except for complex individual equipment or systems. Place I/O expansion units in the same cabinet as the digital controller.

2.1.1.2 Environmental Limits

Controllers shall be suitable for, or placed in protective enclosures suitable for the environment (temperature, humidity, dust, and vibration) where they are located.

2.1.1.3 Stand-Alone Controllers

Provide stand-alone direct digital controllers with internal time clocks. Each piece of equipment shall be controlled by a single controller to provide stand-alone control. All I/O points specified for a piece of equipment shall be integral to its controller and serial connected expansion modules. Provide stable and reliable stand-alone control using default values for values normally read over the network.

2.1.1.4 Internal Clock

Provide internal clocks and scheduling for all Direct Digital Controllers. Provide controllers with BTL listed profiles for all BACnet Building Controllers (B-BC) and BACnet Advanced Application Controllers (B-AAC) using BACnet time synchronization services. This includes but is not limited to VAV Controllers, Fan Coil controllers, Heat Pump controllers and any terminal controllers. BACnet Application specific controllers (B-ASC) will only be accepted for dedicated small exhaust system control such as restroom and mechanical room exhaust fans. Automatically synchronize system clocks daily from an operator-designated controller. The system shall automatically adjust for daylight saving time.

2.1.1.5 Memory

Provide sufficient memory for each controller to support the required control, communication, trends, alarms, and messages. Protect programs residing in memory with EEPROM, flash memory, or by an uninterruptible power source (battery or uninterruptible power supply). The backup power source shall have capacity to maintain the memory during a 72-hour continuous power outage. Rechargeable power sources shall be constantly charged while the controller is operating under normal line power. Batteries shall be replaceable without soldering. Trend and alarm history collected during normal operation shall not be lost during power outages less than 72 hours long.

2.1.1.6 Immunity to Power Fluctuations

Controllers shall operate at 90 percent to 110 percent nominal voltage rating.

2.1.1.7 Transformer

The controller power supply shall be fused or current limiting and rated at 125 percent power consumption.

2.1.1.8 Wiring Terminations

Use screw terminal wiring terminations for all field-installed controllers. Provide field-removable modular terminal strip or a termination card connected by a ribbon cable for all controllers other than terminal units.

2.1.1.9 Input and Output Interface

Provide hard-wired input and output interface for all controllers as follows:

a. Protection: Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with sources up to 24 volts AC or DC for any duration shall cause no controller damage.

b. Binary Inputs: Binary inputs shall have a toggle switch and monitor on and off contacts from a "dry" remote device without external power, and external 5-24 VDC voltage inputs.

c. Pulse Accumulation Inputs: Pulse accumulation inputs shall conform to binary input requirements and accumulate pulses at a resolution suitable to the application.

d. Analog Inputs: Analog inputs shall monitor low-voltage (0-10 VDC), current (4-20 mA), or resistance (thermistor or RTD) signals.

e. Binary Outputs: Binary outputs shall have a toggle switch and send a pulsed 24 VDC low-voltage signal for modulation control, or provide a maintained open-closed position for on-off control. For HVAC equipment and plant controllers, provide for manual overrides, either with three-position (on-off-auto) override switches and status lights, or with an adjacent operator display and interface. Where appropriate, provide a method to select normally open or normally closed operation.

f. Analog Outputs: Analog outputs shall send modulating 0-10 VDC or 4-20 mA signals to control output devices.

g. Tri-State Outputs: Tri-State outputs shall provide three-point floating control of terminal unit electronic actuators.

2.1.1.10 Communications Ports

a. Direct-Connect Interface Ports: Provide at least one extra communication port at each local BACnet network for direct connecting a notebook computer or BACnet hand-held terminal so all network BACnet objects and properties may be viewed and edited by the operator.

b. BACnet routers supporting ARCnet shall also be capable of supporting MS/TP.

2.1.1.11 Digital Controller Cabinet

Provide each digital controller in a factory fabricated cabinet enclosure. Cabinet shall be locked and alarmed. The alarm shall include both a local audible alarm and a networked alarm (e.g., switch connected to controller DI). Networked alarm events shall be recorded remotely for a period not less than one year.

Cabinets located indoors shall protect against dust and have a minimum NEMA 1 rating, except where indicated otherwise. Cabinets located outdoors or in damp environments shall protect against all outdoor conditions and have a minimum NEMA 4 rating. Outdoor control panels and controllers must be able to withstand extreme ambient conditions, without malfunction or failure, whether or not the controlled equipment is running. If necessary, provide a thermostatically controlled panel heater in freezing locations, and an internal ventilating fan in locations exposed to direct sunlight. Cabinets shall have a hinged lockable door and an offset removable metal back plate, except controllers integral with terminal units, like those mounted on VAV boxes. Provide like-keyed locks for all hinged panels provided and a set of two keys at each panel, with one key inserted in the lock.

2.1.1.12 Main Power Switch and Receptacle

Provide each control cabinet with a main external power on/off switch located inside the cabinet. Also provide each cabinet with a separate 120 VAC duplex receptacle.

2.1.2 DDC Software

2.1.2.1 Programming

Provide programming to execute the sequence of operation indicated. Provide all programming and tools to configure and program all controllers. Provide programming routines in simple, easy-to-follow logic with detailed text comments describing what the logic does and how it corresponds to the project's written sequence of operation. All logic programming and control functions shall be closed loop, command and feedback for fault detection and alarming when status != command.

a. Graphic-based programming shall use a library of function blocks made from pre-programmed code designed for BAS control. Function blocks shall be assembled with interconnecting lines, depicting the control sequence in a flowchart.

b. Menu-based programming shall be done by entering parameters, definitions, conditions, requirements, and constraints.

c. For line-by-line and text-based programming, declare variable types (variable types include but are not limited to the following: Local, global, real, and integer) at the beginning of the program. Use descriptive comments frequently to describe the programming.

2.1.2.2 Parameter Modification

All writeable object properties, and all other programming parameters needed to comply with the project specification shall be adjustable for devices at any network level, including those accessible with web-browser communication, and regardless of programming methods used to create the

applications.

2.1.2.3 Short Cycling Prevention

Provide setpoint differentials and minimum on/off times to prevent equipment short cycling.

2.1.2.4 Equipment Status Delay

Provide an adjustable delay from when equipment is commanded on or off and when the control program looks to the status input for confirmation.

2.1.2.5 Run Time Accumulation

Use the Elapsed Time Property to provide re-settable run time accumulation for each Binary Output Object connected to mechanical loads greater than 1 HP, electrical loads greater than 10 KW, or wherever else specified.

2.1.2.6 Timed Local Override

Provide an adjustable override time for each push of a timed local override button.

2.1.2.7 Time Synchronization

Provide time synchronization, including adjustments for leap years, daylight saving time, and operator time adjustments.

2.1.2.8 Scheduling

Provide operating schedules as indicated, with equipment assigned to groups. Changing the schedule of a group shall change the operating schedule of all equipment in the group. Groups shall be capable of operator creation, modification, and deletion. Provide capability to view and modify schedules in a seven-day week format. Provide capability to enter holiday and override schedules one full year at a time.

2.1.2.9 Object Property Override

Allow writeable object property values to accept overrides to any valid value. Where specified or required for the sequence of control, the Out-Of-Service property of Objects shall be modifiable using BACnet's write property service. When documented, exceptions to these requirement are allowed for life, machine, and process safeties.

2.1.2.10 Alarms and Events

Alarms and events shall be capable of having programmed time delays and high-low limits -- alarms/events shall be stored within a device on the BACnet network until connected to a user interface device and retrieved. Provide alarms/events in agreement with the point schedule, sequence of operation, and the BAS Owner. At a minimum, provide programming to initiate alarms/events any time a piece of equipment fails to operate, a control point is outside normal range or condition shown on schedules, communication to a device is lost, a device has failed, or a controller has lost its memory.

2.1.2.11 Trending

Provide BACnet trend services capable of trending all object present values set points, and other parameters indicated for trending on project schedules. Trends may be associated into groups, and a trend report may be set up for each group. Trends are stored within a device on the BACnet network, with operator selectable trend intervals from 10 seconds up to 60 minutes. The minimum number of consecutive trend values stored at one time shall be 100 per variable. When trend memory is full, the most recent data shall overwrite the oldest data.

The BACnet system shall allow for Change-Of-Value (COV) subscription based trending at user defined thresholds.

2.1.2.12 Device Diagnostics

Each controller shall have diagnostic LEDs for power, communication, and device fault condition. The DDC system shall recognize and report a non-responsive controller.

2.1.2.13 Device Management

System shall be capable of managing devices remotely to include updating/loading firmware, restarting, and network configuration. These capabilities shall be restricted to authorized roles. The system shall support, either natively or with provided add-on software, remote read/write and management of BBMD tables.

2.1.2.14 Power Loss

Upon restoration of power, the DDC system shall perform an orderly restart and restoration of control.

2.1.3 BACnet Operator Software

2.2 SENSORS AND INPUT HARDWARE

Coordinate sensor types with the Owner to keep them consistent with existing installations.

2.2.1 Field-Installed Temperature Sensors

Where feasible, provide the same sensor type throughout the project. Avoid using transmitters unless absolutely necessary.

2.2.1.1 Thermistors

Precision thermistors may be used in applications below 200 degrees F. Sensor accuracy over the application range shall be 0.36 degree F or less between 32 to 150 degrees F. Stability error of the thermistor over five years shall not exceed 0.25 degrees F cumulative. A/D conversion resolution error shall be kept to 0.1 degrees F. Total error for a thermistor circuit shall not exceed 0.5 degrees F.

2.2.1.2 Resistance Temperature Detectors (RTDs)

Provide RTD sensors with platinum elements compatible with the digital controllers. Encapsulate sensors in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1

percent (1 ohm) of expected ohms (1000 ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degrees F cumulative. Direct connection of RTDs to digital controllers without transmitters is preferred. When RTDs are connected directly, lead resistance error shall be less than 0.25 degrees F. The total error for a RTD circuit shall not exceed 0.5 degrees F.

2.2.1.3 Temperature Sensor Details

a. Room Type: Provide the sensing element components within a decorative protective cover suitable for surrounding decor.

b. Duct Probe Type: Ensure the probe is long enough to properly sense the air stream temperature.

c. Duct Averaging Type: Continuous averaging sensors shall be one foot in length for each 4 square feet of duct cross-sectional area, and a minimum length of 6 feet.

d. Pipe Immersion Type: Provide minimum three-inch immersion. Provide each sensor with a corresponding pipe-mounted sensor well, unless indicated otherwise. Sensor wells shall be stainless steel when used in steel piping, and brass when used in copper piping. Provide the sensor well with a heat-sensitive transfer agent between the sensor and the well interior.

e. Outside Air Type: Provide the sensing element on the building's north side with a protective weather shade that positions the sensor approximately 3 inches off the wall surface, does not inhibit free air flow across the sensing element, and protects the sensor from snow, ice, and rain.

2.2.2 Transmitters

Provide transmitters with 4 to 20 mA or 0 to 10 VDC linear output scaled to the sensed input. Transmitters shall be matched to the respective sensor, factory calibrated, and sealed. Size transmitters for an output near 50 percent of its full-scale range at normal operating conditions. The total transmitter error shall not exceed 0.1 percent at any point across the measured span. Supply voltage shall be 12 to 24 volts AC or DC. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter drift shall not exceed 0.03 degrees F a year.

2.2.2.1 Relative Humidity Transmitters

Provide transmitters with an accuracy equal to plus or minus 5 percent from 0 to 90 percent scale, and less than one percent drift per year. Sensing elements shall be the polymer type.

2.2.2.2 Pressure Transmitters

Provide transmitters integral with the pressure transducer.

2.2.3 Current Transducers

Provide current transducers to monitor motor amperage, unless current switches are shown on design drawings or point tables.

2.2.4 Input Switches

2.2.4.1 Anti-Terrorism Force Protection Shutoff Switch

Provide switch to override the operation of the dedicated indoor air unit and to close intake dampers. The shutdown switch is to consist of a plastic push button and a plastic cover. The switch shall read "Emergency Intake Air Shutdown."

2.2.5 Freeze Protection Thermostats

Provide special purpose thermostats with flexible capillary elements 20 feet minimum length for coil face areas up to 40 square feet. Provide longer elements for larger coils at 1-foot of element for every 4 square feet of coil face area, or provide additional thermostats. Provide switch contacts rated for the respective motor starter's control circuit voltage. Include auxiliary contacts for the switch's status condition. A freezing condition at any 18-inch increment along the sensing element's length shall activate the switch. The thermostat shall be equipped with a manual push-button reset switch so that when tripped, the thermostat requires manual resetting before the HVAC equipment can restart.

2.3 OUTPUT HARDWARE

2.3.1 Control Valves

2.3.1.1 Valve Assembly

Valve bodies shall be designed for 125 psig minimum working pressure or 150 percent of the operating pressure, whichever is greater. Valve stems shall be Type 316 stainless steel. Valve leakage ratings shall be 0.01 percent of rated Cv value. Class 125 copper alloy valve bodies and Class 150 steel or stainless steel valves shall meet the requirements of ASME B16.5. Cast iron valve components shall meet the requirements of ASTM A126 Class B or C.

2.3.1.2 Two-Way Valves

Two-way modulating valves shall have an equal percentage characteristic.

2.3.1.3 Valves for Hot Water Service

Valves for hot water service below 250 Degrees F:

a. Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze, or iron. Bodies for 2 inch valves shall have threaded connections. Bodies for valves from 2-1/2 to 3 inches shall have flanged connections.

b. Internal trim (including seats, seat rings, modulation plugs, valve stems, and springs) of valves controlling water above 210 degrees F shall be Type 316 stainless steel.

c. Internal trim for valves controlling water 210 degrees F or less shall be brass or bronze. Valve stems shall be Type 316 stainless steel.

d. Non-metallic parts of hot water control valves shall be suitable for a minimum continuous operating temperature of 250 degrees F or 50

degrees F above the system design temperature, whichever is higher.

e. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.

f. Valves 4 inches and larger shall be butterfly valves, unless indicated otherwise.

2.3.1.4 Valves for Steam Service

The entire body for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 to 3 inches inclusive shall be of brass, bronze, or carbon steel. Bodies for valves 4 inches and larger shall be carbon steel. Bodies for 2 inch valves shall have threaded connections. Bodies for valves 2-1/2 inches and larger shall have flanged connections. Steam valves shall be sized for 15 psig inlet steam pressure with a maximum 13 psi differential through the valve at rated flow, except where indicated otherwise. Internal valve trim shall be Type 316 stainless steel.

2.3.2 Actuators

Provide direct-drive electric actuators for all control applications, except where indicated otherwise. All actuators shall include a feedback loop for detecting actuator faults. The actuator shall report actual position back to the control system. Binary actuators shall provide open/closed status, at a minimum. Modulating actuators and process shall provide position feedback expressed (directly or through span conversion) as percent open/closed. Actuator status shall be derived from actuator position; however, effect may be used in cases where direct feedback is not practical such as VAV coils and dampers.

Use airflow sensors as a feedback loop for damper actuators. Use differential temperature as a feedback mechanism for VAV coil valve actuation.

2.3.2.1 Electric Actuators

Each actuator shall deliver the torque required for continuous uniform motion and shall have internal end switches to limit the travel, or be capable of withstanding continuous stalling without damage. Actuators shall function properly within 85 to 110 percent of rated line voltage. Provide actuators with hardened steel running shafts and gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch-pounds. Provide two-position actuators of single direction, spring return, or reversing type. Provide modulating actuators capable of stopping at any point in the cycle, and starting in either direction from any point. Actuators shall be equipped with a switch for reversing direction, and a button to disengage the clutch to allow manual adjustments. Provide the actuator with a hand crank for manual adjustments, as applicable. Thermal type actuators may only be used on terminal fan coil units, terminal VAV units, convectors, and unit heaters. Spring return actuators shall be provided on all control dampers and all control valves except terminal fan coil units, terminal VAV units, convectors, and unit heaters; unless indicated otherwise. Each actuator shall have distinct markings indicating the full-open and full-closed position, and the points in-between.

2.3.3 Output Switches

2.3.3.1 Control Relays

Field installed and DDC panel relays shall be double pole, double throw, UL listed, with contacts rated for the intended application, indicator light, and dust proof enclosure. The indicator light shall be lit when the coil is energized and off when coil is not energized. Relays shall be the socket type, plug into a fixed base, and replaceable without tools or removing wiring. Encapsulated "PAM" type relays may be used for terminal control applications.

2.4 ELECTRICAL POWER AND DISTRIBUTION

2.4.1 Transformers

Transformers shall conform to UL 506. For control power other than terminal level equipment, provide a fuse or circuit breaker on the secondary side of each transformer.

2.4.2 Surge and Transient Protection

Provide each digital controller with surge and transient power protection. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

2.4.2.1 Power Line Surge Protection

Provide surge suppressors on the incoming power at each direct digital controller or grouped terminal controllers and shall be installed externally to the device or devices being protected. Surge suppressors shall be rated in accordance with UL 1449, have a fault indicating light, and conform to the following:

a. The device shall be a transient voltage surge suppressor, hard-wire type individual equipment protector for 120 VAC/1 phase/2 wire plus ground.

b. The device shall react within 5 nanoseconds and automatically reset.

c. The voltage protection threshold, line to neutral, shall be no more than 211 volts.

d. The device shall have an independent secondary stage equal to or greater than the primary stage joule rating.

e. The primary suppression system components shall be pure silicon avalanche diodes.

f. The secondary suppression system components shall be silicon avalanche diodes or metal oxide varistors.

g. The device shall have an indication light to indicate the protection components are functioning.

h. All system functions of the transient suppression system shall be individually fused and not short circuit the AC power line at any time.

i. The device shall have an EMI/RFI noise filter with a minimum

attenuation of 13 dB at 10 kHz to 300 MHz.

j. The device shall comply with IEEE C62.41.1 and IEEE C62.41.2, Class "B" requirements and be tested according to IEEE C62.45.

k. The device shall be capable of operating between minus 20 degrees F and plus 122 degrees F.

2.4.2.2 Telephone and Communication Line Surge Protection

Provide surge and transient protection for DDC controllers and DDC network related devices connected to phone and network communication lines, in accordance with the following:

a. The device shall provide continuous, non-interrupting protection, and shall automatically reset after safely eliminating transient surges.

b. The protection shall react within 5 nanoseconds using only solid-state silicon avalanche technology.

c. The device shall be installed at the distance recommended by its manufacturer.

2.4.2.3 Controller Input/Output Protection

Provide controller inputs and outputs with surge protection via optical isolation, metal oxide varistors (MOV), or silicon avalanche devices. Fuses are not permitted for surge protection.

2.4.3 Wiring

Provide complete electrical wiring for the DDC System, including wiring to transformer primaries. Unless indicated otherwise, provide all normally visible or otherwise exposed wiring in conduit. Where conduit is required, control circuit wiring shall not run in the same conduit as power wiring over 100 volts. Circuits operating at more than 100 volts shall be in accordance with Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Run all circuits over 100 volts in conduit, metallic tubing, covered metal raceways, or armored cable. Use plenum-rated cable for circuits under 100 volts in enclosed spaces. Examples of these spaces include HVAC plenums, within walls, above suspended ceilings, in attics, and within ductwork.

2.4.3.1 Power Wiring

The following requirements are for field-installed wiring:

a. Wiring for 24 V circuits shall be insulated copper 18 AWG minimum and rated for 300 VAC service.

b. Wiring for 120 V circuits shall be insulated copper 14 AWG minimum and rated for 600 VAC service.

2.4.3.2 Analog Signal Wiring

Field-installed analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded and have a 20 AWG drain wire. Each wire shall have insulation rated for 300 VAC service. Cables shall have an overall aluminum-polyester or tinned-copper

cable-shield tape.

PART 3 EXECUTION

3.1 INSTALLATION

Perform the installation under the supervision of competent technicians regularly employed in the installation of DDC systems.

3.1.1 BACnet Naming and Addressing

Coordinate with the BAS Owner and provide unique naming and addressing for BACnet networks and devices.

a. MAC Address

Every BACnet device shall have an assigned and documented MAC Address unique to its network. For Ethernet networks, document the MAC Address assigned at its creation. For ARCNET or MS/TP, assign from 01 to 64.

b. Network Numbering

Assign unique numbers to each new network installed on the BACnet internetwork. Provide ability for changing the network number; either by device switches, network computer, or field operator interface. The BACnet internetwork (all possible connected networks) can contain up to 65,534 possible unique networks.

c. Device Object Identifier Property Number

Assign unique Device "Object_Identifier" property numbers or device instances for each device on the BACnet internetwork. Provide for future modification of the device instance number; either by device switches, network computer, or field interface. BACnet allows up to 4,194,302 possible unique devices per internetwork.

d. Device Object Name Property Text

The Device Object Name property field shall support 32 minimum printable characters. Assign unique Device "Object_Name" property names with plain-English descriptive names for each device
For example, the Device Object Name that for the device controlling the chiller plant at Building 3408 would be:

Device Object_Name = CW System B3408

A Device Object Name for a VAV box controller might be:

Device Object_Name = VAV BOX25

e. Object Name Property Text (Other than Device Objects)

The Object Name property field shall support 32 minimum printable characters. Assign Object Name properties with plain-English names descriptive of the application using camelCase. Abbreviations, while necessary, shall be standard throughout the control environment and unique (i.e., Don't use SA for supply air temperature everywhere there is air blowing. Use it for FAN supply air temperature, and use a

different abbreviation for VAV supply air temperature). Examples include "Zone 1 Temperature" and "Fan Start/Stop."

f. Object Identifier Property Number (Other than Device Objects)

Assign Object Identifier property numbers according to design drawings or tables if provided. If not provided, Object Identifier property numbers may be assigned at the Contractor's discretion but must be approved by the Government. In this case they must be documented and unique for like object types within the device.

3.1.2 Minimum BACnet Object Requirements

a. Use of Standard BACnet Objects

For the following points and parameters, use standard BACnet objects, where all relevant object properties can be read using BACnet's Read Property Service, and all relevant object properties can be modified using BACnet's Write Property Service:
all device physical inputs and outputs, all set points, all PID tuning parameters, all calculated pressures, flow rates, and consumption values, all alarms, all trends, all schedules, and all equipment and lighting circuit operating status.

b. BACnet Object Description Property

The Object Description property shall support 32 minimum printable characters. For each object, complete the description property field using a brief, narrative, plain English description specific to the object and project application. For example: "HW Pump 1 Proof." Document compliance, length restrictions, and whether the description is writeable in the device PICS.

c. Analog Input, Output, and Value Objects

Support and provide Description and Device_Type text strings matching signal type and engineering units shown on the points list.

d. Binary Input, Output, and Value Objects

Support and provide Inactive_Text and Active_Text property descriptions matching conditions shown on the points list.

e. Calendar Object

For devices with scheduling capability, provide at least one Calendar Object with ten-entry capacity. All operators may view Calendar Objects; authorized operators may make modifications from a controller. Enable the writeable Date List property and support all calendar entry data types.

f. Schedule Object

Use Schedule Objects for system scheduling. All operators may view schedule entries; authorized operators may modify schedules from a controller.

g. Loop Object or Equal

Use Loop Objects or equivalent BACnet objects in each applicable field device for PID control. Regardless of program method or object used, allow authorized operators to adjust the Update Interval, Setpoint, Proportional Constant, Integral Constant, and Derivative Constant using BACnet read/write services.

3.1.3 Minimum BACnet Service Requirements

a. Command Priorities

Use commandable BACnet objects to control machinery and systems, providing the priority levels listed below. If the sequence of operation requires a different priority, obtain approval from the Contracting Officer.

Priority Level	Application
1	Manual-Life Safety
2	Automatic-Life Safety
3	(User Defined)
4	(User Defined)
5	Critical Equipment Control
6	Minimum On/Off
7	(User Defined)
8	Manual Operator
9	(User Defined)
10	(User Defined)
11	Load Shedding
12	(User Defined)
13	(User Defined)
14	(User Defined)
15	(User Defined)
16	(User Defined)

b. Alarming

1. Alarm Priorities - Coordinate alarm and event notification with the BAS Owner.

2. Notification Class - Enable writeable Priority, Ack Required, and Recipient List properties of Notification Class objects.

3. Event Notification Message Texts - Use condition specific narrative text and numerical references for alarm and event notification.

c. Updating Displayed Property Values

Allow controllers to display property values at discrete polled intervals, or based on receipt of confirmed and unconfirmed Change of Value notifications. The COV increment shall be adjustable by an operator using BACnet services, and polled intervals shall be adjustable at the operator controllers.

3.1.4 Local Area Networks

Obtain Government approval before connecting new networks with existing networks. Network numbers and device instance numbers shall remain unique when joining networks. Do not change existing network addressing without Government approval. See also "BACnet Naming and Addressing."

3.1.5 Wiring Criteria

a. Run circuits operating at more than 100 volts in rigid or flexible conduit, metallic tubing, covered metal raceways, or armored cable.

b. Do not run binary control circuit wiring in the same conduit as power wiring over 100 volts. Where analog signal wiring requires conduit, do not run in the same conduit with AC power circuits or control circuits operating at more than 100 volts.

c. Provide circuit and wiring protection required by NFPA 70.

d. Run all wiring located inside mechanical rooms in conduit.

e. Do not bury aluminum-sheathed cable or aluminum conduit in concrete.

f. Input/output identification: Permanently label each field-installed wire, cable, and pneumatic tube at each end with descriptive text using a commercial wire marking system that fully encircles the wire, cable, or tube. Locate the markers within 2 inches of each termination. Match the names and I/O number to the project's point list. Similarly label all power wiring serving control devices, including the word "power" in the label. Number each pneumatic tube every six feet. Label all terminal blocks with alpha/numeric labels. All wiring and the wiring methods shall be in accordance with UL 508A.

g. For controller power, provide new 120 VAC circuits, with ground. Provide each circuit with a dedicated breaker, and run wiring in its own conduit, separate from any control wiring. Connect the controller's ground wire to the electrical panel ground; conduit grounds are not acceptable.

h. Surge Protection: Install surge protection according to manufacturer's instructions. Multiple controllers fed from a common power supply may be protected by a common surge protector, properly sized for the total connected devices.

i. Grounding: Ground controllers and cabinets to a good earth ground as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Conduit

grounding is not acceptable; all grounding shall have a direct path to the building earth ground. Ground sensor drain wire shields at the controller end.

j. The Contractor shall be responsible for correcting all associated ground loop problems.

k. Run wiring in panel enclosures in covered wire track.

3.1.6 Accessibility

Install all equipment so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install digital controllers, data ports, and concealed actuators, valves, dampers, and like equipment in locations freely accessible through access doors.

3.1.7 Digital Controllers

a. Install as stand alone control devices (see definitions).

b. Locate control cabinets at the locations shown on the drawings. If not shown on the drawings, install in the most accessible space, close to the controlled equipment.

3.1.8 Temperature Sensors

Install temperature sensors in locations that are accessible and provide a good representation of sensed media. Installations in dead spaces are not acceptable. Calibrate sensors according to manufacturer's instructions. Do not use sensors designed for one application in a different application.

3.1.8.1 Room Temperature Sensors

Mount the sensors on interior walls to sense the average room temperature at the locations indicated. Avoid locations near heat sources such as copy machines or locations by supply air outlet drafts. Mount the center of the sensor at the height indicated.

3.1.8.2 Duct Temperature Sensors

a. Probe Type: Provide a gasket between the sensor housing and the duct wall. Seal the duct penetration air tight. Seal the duct insulation penetration vapor tight.

b. Averaging Type (and coil freeze protection thermostats): Weave the capillary tube sensing element in a serpentine fashion perpendicular to the flow, across the duct or air handler cross-section, using durable non-metal supports. Prevent contact between the capillary and the duct or air handler internals. Provide a duct access door at the sensor location. The access door shall be hinged on the side, factory insulated, have cam type locks, and be as large as the duct will permit, maximum 18 by 18 inches. For sensors inside air handlers, the sensors shall be fully accessible through the air handler's access doors without removing any of the air handler's internals.

3.1.8.3 Immersion Temperature Sensors

Provide thermowells for sensors measuring piping, tank, or pressure vessel temperatures. Locate wells to sense continuous flow conditions. Do not

install wells using extension couplings. Where piping diameters are smaller than the length of the wells, provide wells in piping at elbows to sense flow across entire area of well. Wells shall not restrict flow area to less than 70 percent of pipe area. Increase piping size as required to avoid restriction. Provide thermal conductivity material within the well to fully coat the inserted sensor.

3.1.8.4 Outside Air Temperature Sensors

Provide outside air temperature sensors in weatherproof enclosures on the north side of the building, away from exhaust hoods and other areas that may affect the reading. Provide a shield to shade the sensor from direct sunlight.

3.1.9 Pressure Sensors

Locate pressure sensors as indicated.

3.1.10 Component Identification Labeling

Using an electronic hand-held label maker with white tape and bold black block lettering, provide an identification label on the exterior of each new control panel, control device, actuator, and sensor. Also provide labels on the exterior of each new control actuator indicating the (full) open and (full) closed positions. For labels located outdoors, use exterior grade label tape, and provide labels on both the inside and outside of the panel door or device cover. Acceptable alternatives are white plastic labels with engraved bold black block lettering permanently attached to the control panel, control device, actuator, and sensor. Have the labels and wording approved by the BAS Owner prior to installation.

3.2 TEST AND BALANCE SUPPORT

The controls contractor shall coordinate with and provide on-site support to the test and balance (TAB) personnel specified under Section 23 05 93 TESTING, ADJUSTING AND BALANCING. This support shall include:

a. On-site operation and manipulation of control systems during the testing and balancing.

b. Control setpoint adjustments for balancing all relevant mechanical systems.

c. Tuning control loops with setpoints and adjustments determined by TAB personnel.

3.3 CONTROLS SYSTEM OPERATORS MANUALS

Provide two electronic and printed copies of a Controls System Operators Manual. The manual shall be specific to the project, written to actual project conditions, and provide a complete and concise depiction of the installed work. Provide information in detail to clearly explain all operation requirements for the control system.

Provide with each manual: CDs of the project's control system drawings, control programs, data bases, graphics, and all items listed below. Include gateway back-up data and configuration tools where applicable. Provide CDs in jewel case with printed and dated project-specific labels on both the CD and the case. For text and drawings, use Adobe Acrobat or

MS Office file types. When approved by the Government, AutoCAD and Visio files are allowed. Give files descriptive English names and organize in folders.

Provide printed manuals in sturdy 3-ring binders with a title sheet on the outside of each binder indicating the project title, project location, contract number, and the controls contractor name, address, and telephone number. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. Manuals shall include the following:

a. A copy of the as-built control system (shop) drawings set, with all items specified under the paragraph SUBMITTALS. Indicate all field changes and modifications.

b. A copy of the project's mechanical design drawings, including any official modifications and revisions.

c. A copy of the project's approved Product Data submittals provided under the paragraph SUBMITTALS.

d. A copy of the project's approved Performance Verification Testing Plan and Report.

e. A copy of the project's approved final TAB Report.

f. Printouts of all control system programs, including controller setup pages if used. Include plain-English narratives of application programs, flowcharts, and source code.

g. Printouts of all physical input and output object properties, including tuning values, alarm limits, calibration factors, and set points.

h. A table entitled "AC Power Table" listing the electrical power source for each controller. Include the building electrical panel number, panel location, and circuit breaker number.

i. The DDC manufacturer's hardware and software manuals in both print and CD format with printed project-specific labels. Include installation and technical manuals for all controller hardware, operator manuals for all controllers, programming manuals for all controllers.

j. A list of qualified control system service organizations for the work provided under this contract. Include their addresses and telephone numbers.

k. A written statement entitled "Technical Support" stating the control system manufacturer or authorized representative will provide toll-free telephone technical support at no additional cost to the Government for a minimum of two years from project acceptance, will be furnished by experienced service technicians, and will be available during normal weekday working hours. Include the toll-free technical support telephone number.

3.4 PERFORMANCE VERIFICATION TESTING (PVT)

3.4.1 General

The PVT shall demonstrate compliance of the control system work with the contract requirements. The PVT shall be performed by the Contractor and witnessed and approved by the Government. If the project is phased, provide separate testing for each phase. A Pre-PVT meeting to review the Pre-PVT Checklist is required to coordinate all aspects of the PVT and shall include the Contractor's QA representative, the Contractor's PVT administrator, the Contracting Officer's representative, and the BAS Owner.

3.4.2 Performance Verification Testing Plan

Submit a detailed PVT Plan of the proposed testing for Government approval. Develop the PVT Plan specifically for the control system in this contract. The PVT Plan shall be a clear list of test items arranged in a logical sequence. Include the purpose of each test, intended test procedure, test setup and test conditions, the expected response, and the pass/fail criteria for every component tested.

The plan shall clearly describe how each item is tested, indicate where assisting personnel are required (like the mechanical contractor), and include what procedures are used to simulate conditions. Include a separate column for each checked item and extra space for comments. Where sequences of operations are checked, insert each corresponding routine from the project’s sequence of operation. For each test area, include signature and date lines for the Contractor's PVT administrator, the Contractor's QA representative, the Contracting Officer's representative, and the Owner to acknowledge successful completion.

3.4.3 PVT Sample Size

Twenty percent sample testing is allowed for identical controllers typical of terminal control. The Government may require testing of like controllers beyond a statistical sample if sample controllers require retesting or do not have consistent results.

The Government may witness all testing, or random samples of PVT items. When only random samples are witnessed, the Government may choose which ones.

3.4.4 Pre-Performance Verification Testing Checklist

Submit the following as a list with items checked off once verified. Provide a detailed explanation for any items that are not completed or verified.

a. Verify all required mechanical installation work is successfully completed, and all HVAC equipment is working correctly (or will be by the time the PVT is conducted).

b. Verify HVAC motors operate below full-load amperage ratings.

c. Verify all required control system components, wiring, and accessories are installed.

d. Verify the installed control system architecture matches approved drawings.

e. Verify all control circuits operate at the proper voltage and are free from grounds or faults.

f. Verify all required surge protection is installed.

g. Verify the A/C Power Table specified in the paragraph CONTROLS SYSTEM OPERATORS MANUALS is accurate.

h. Verify all DDC network communications function properly, including uploading and downloading programming changes.

i. Using the BACnet protocol analyzer (if provided or required in this specification), verify communications are error free.

j. Verify each digital controller’s programming is backed up.

k. Verify all wiring, components, and panels are properly labeled.

l. Verify all required points are programmed into devices.

m. Verify all TAB work affecting controls is complete.

n. Verify all valve and actuator zero and span adjustments are set properly.

o. Verify all sensor readings are accurate and calibrated.

p. Verify each control valve and actuator goes to normal position upon loss of power.

q. Verify all control loops are tuned for smooth and stable operation. View trend data where applicable.

r. Verify each controller works properly in stand-alone mode.

s. Verify all safety controls and devices function properly, including freeze protection and interfaces with building fire alarm systems.

t. Verify all electrical interlocks work properly.

u. Verify the as-built (shop) control drawings are completed.

3.4.5 Conducting Performance Verification Testing

a. Conduct Government-witnessed PVT after approval of the PVT Plan and the completed Pre-PVT Checklist. Notify the Contracting Officer of the planned PVT at least 15 days prior to testing. Provide an estimated time table required to perform the testing. Furnish personnel, equipment, instrumentation, and supplies necessary to perform all aspects of the PVT. Ensure that testing personnel are regularly employed in the testing and calibration of DDC systems. Using the project's as-built control system (shop) drawings, the project's mechanical design drawings, the approved Pre-PVT Checklist, and the approved PVT Plan, conduct the PVT.

b. During testing, identify any items that do not meet the contract requirements and if time permits, conduct immediate repairs and re-test. Otherwise, deficiencies shall be investigated, corrected,

and re-tested later. Document each deficiency and corrective action taken.

c. If re-testing is required, follow the procedures for the initial PVT. The Government may require re-testing of any control system components affected by the original failed test.

3.4.6 Controller Capability and Labeling

Test the following for each controller:

a. Memory: Demonstrate that programmed data, parameters, and trend/ alarm history collected during normal operation is not lost during power failure.

b. Direct Connect Interface: Demonstrate the ability to connect directly to each type of digital controller with a portable electronic device like a notebook computer or PDA. Show that maintenance personnel interface tools perform as specified in the manufacturer's technical literature.

c. Stand Alone Ability: Demonstrate controllers provide stable and reliable stand-alone operation using default values or other method for values normally read over the network.

d. Wiring and AC Power: Demonstrate the ability to disconnect any controller safely from its power source using the AC Power Table. Demonstrate the ability to match wiring labels easily with the control drawings. Demonstrate the ability to locate a controller's location using the BACnet Communication Architecture Schematic and floor plans.

e. Nameplates and Tags: Show the nameplates and tags are accurate and permanently attached to control panel doors, devices, sensors, and actuators.

3.4.7 Execution of Sequence of Operation

Demonstrate that the HVAC system operates properly through the complete sequence of operation. Use read/write property services to globally read and modify parameters over the internetwork.

3.4.8 Control Loop Stability and Accuracy

For all control loops tested, give the Government trend graphs of the control variable over time, demonstrating that the control loop responds to a 20 percent sudden change of the control variable set point without excessive overshoot and undershoot. If the process does not allow a 20 percent set point change, use the largest change possible. Show that once the new set point is reached, it is stable and maintained. Control loop trend data shall be in real-time with the time between data points 30 seconds or less.

3.4.9 Performance Verification Testing Report

Upon successful completion of the PVT, submit a PVT Report to the Government and prior to the Government taking use and possession of the facility. Do not submit the report until all problems are corrected and successfully re-tested. The report shall include the annotated PVT Plan used during the PVT. Where problems were identified, explain each problem

and the corrective action taken. Include a written certification that the installation and testing of the control system is complete and meets all of the contract's requirements.

3.5 TRAINING REQUIREMENTS

Provide a qualified instructor (or instructors) with two years minimum field experience with the installation and programming of similar BACnet DDC systems. Orient training to the specific systems installed. Coordinate training times and location with the Contracting Officer and BAS Owner after receiving approval of the training course documentation. Training shall take place at the job site. A training day shall occur during normal working hours, last no longer than 8 hours and include a one-hour break for lunch and two additional 15-minute breaks. The project's approved Controls System Operators Manual shall be used as the training text. The Contractor shall ensure the manuals are submitted, approved, and available to hand out to the trainees before the start of training.

3.5.1 Training Documentation

Submit training documentation for review 30 days minimum before training. Documentation shall include an agenda for each training day, objectives, a synopses of each lesson, and the instructor's background and qualifications. The training documentation can be submitted at the same time as the project's Controls System Operators Manual.

3.5.2 Phase I Training - Fundamentals

The Phase I training session shall last one day and be conducted in a classroom environment with complete audio-visual aids provided by the contractor. Provide each trainee a printed 8.5 by 11 inch hard-copy of all visual aids used. Upon completion of the Phase I Training, each trainee should fully understand the project's DDC system fundamentals. The training session shall include the following:

a. BACnet fundamentals (objects, services, addressing) and how/where they are used on this project

b. This project's list of control system components

c. This project's list of points and objects

d. This project's sequences of control, and:

e. Alarm capabilities

f. Trending capabilities

g. Troubleshooting communication errors

h. Troubleshooting hardware errors

3.5.3 Phase II Training - Operation

Provide Phase II Training shortly after completing Phase I Training. The Phase II training session shall last one day. Upon completion of the Phase II Training, each trainee should fully understand the project's DDC system operation. The training session shall include the following:

a. A walk-through tour of the mechanical system and the installed DDC components (components include but are not limited to the following: Controllers, valves, dampers, surge protection, switches, thermostats, and sensors)

b. A discussion of the components and functions at each DDC panel

c. Modifying setpoints

d. Creating, editing, and viewing trends

e. Creating, editing, and viewing alarms

f. Creating, editing, and viewing operating schedules and schedule objects

g. Alarm and Event management

-- End of Section --

SECTION 23 64 26

HEATING-HOT WATER PIPING SYSTEMS
08/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22/CSA 4.4	(2015) Relief Valves for Hot Water Supply Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015) Structural Welding Code - Steel
AWS Z49.1	(2012) Safety in Welding and Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(2013) Pipe Threads, General Purpose (Inch)
ASME B16.1	(2010) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(2013) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.39	(2014) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.9	(2014) Building Services Piping

ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A733	(2013) Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B42	(2015a) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B62	(2015) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B75/B75M	(2011) Standard Specification for Seamless Copper Tube
ASTM B813	(2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B88	(2014) Standard Specification for Seamless Copper Water Tube
ASTM D3308	(2012) PTFE Resin Skived Tape
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F1199	(1988; R 2015) Cast (All Temperatures and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum)

HYDRAULIC INSTITUTE (HI)

HI 1.1-1.2	(2014) Rotodynamic (Centrifugal) Pump for Nomenclature and Definitions

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-110	(2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
MSS SP-25	(2013) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-67	(2011) Butterfly Valves
MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-80	(2013) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2014) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

1.2 SYSTEM DESCRIPTION

Provide the water systems having the minimum service (design) temperature-pressure rating indicated. Provision of the piping systems, including materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with the required and advisory provisions of ASME B31.9 except as modified or supplemented by this specification section or design drawings. This specification section covers the water systems piping which is located within, on, and adjacent to building(s) within the building(s) 5 foot line.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Automatic Balancing Valves; G

Calibrated Balancing Valves; G

Pressure Relief Valve

Pumps; G

Combination Strainer and Pump Suction Diffuser; G

SD-06 Test Reports

Piping Welds NDE Report

Pressure Tests Reports

Report shall be provided in bound 8-1/2 by 11 inch booklets. In the reports, document all phases of the tests performed. Include initial test summaries, all repairs/adjustments made, and the final test results.

SD-07 Certificates

Employer's Record Documents (For Welding)

Welding Procedures and Qualifications

Certificates shall be submitted for the following items showing conformance with the referenced standards contained in this section.

Fittings

Unions

Flanges

Gaskets

SD-08 Manufacturer's Instructions

Lesson plan for the Instruction Course; G

SD-10 Operation and Maintenance Data

Requirements for data packages are specified Section 01 78 23 OPERATION AND MAINTENANCE DATA, except as supplemented and modified by this specification section.

Submit spare parts data for each different item of equipment specified, with operation and maintenance data packages. Include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

Submit a list of qualified permanent service organizations with operation and maintenance data packages. Include service organization addresses and service area or expertise. The service organizations shall be reasonably convenient to the equipment

installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

Automatic Balancing Valves, Data Package 3; G

Calibrated Balancing Valves, Data Package 3; G

Pressure Relief Valve, Data Package 2

Pumps, Data Package 3; G

Combination Strainer and Pump Suction Diffuser, Data Package 2; G

1.4 MODIFICATIONS TO REFERENCES

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

1.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." R eferences to the "owner" shall be interpreted to mean the "Contracting Officer." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.5 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired.

1.6 DELIVERY, STORAGE, AND HANDLING

Protect stored items from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, cap piping and similar openings to keep out dirt and other foreign matter. Any porous

materials found to be contaminated with mold or mildew will be replaced at the Contractor's expense. Non-porous materials found to be contaminated with mold or mildew will be disinfected and cleaned prior to installation.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.7.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

1.7.3 Accessibility

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 STANDARD COMMERCIAL PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening.

The two year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures.

Products having less than a 2 year field service record shall be acceptable if a certified record of satisfactory field operation, for not less than 6,000 hours exclusive of the manufacturer's factory tests, can be shown. System components shall be environmentally suitable for the indicated locations.

The equipment items shall be supported by service organizations. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

2.2 STEEL PIPING

Water piping shall be steel pipe or copper tubing. Provide steel piping with a ANSI/ASME Class 125 service rating, which for 150 degrees F, the

pressure rating is 175 psig.

2.2.1 Pipe

Steel pipe, conform to ASTM A53/A53M, Schedule 40, Type E or S, Grades A or B. Do not use Type F pipe.

2.2.2 Fittings and End Connections (Joints)

Piping and fittings 1 inch and smaller shall have threaded connections. Piping and fittings larger than 1 inch and smaller than 3 inches shall have either threaded or welded connections. Piping and fittings 3 inches and larger shall have welded or flanged connections. The manufacturer of each fitting shall be permanently identified on the body of the fitting in accordance with MSS SP-25.

2.2.2.1 Threaded Connections

Use threaded valves and pipe connections conforming to ASME B1.20.1. Used threaded fitting conforming to ASME B16.3. Use threaded unions conforming to ASME B16.39. Use threaded pipe nipples conforming to ASTM A733.

2.2.2.2 Flanged Connections

Flanges shall conform to ASME B16.1, Class 125. Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type. These gaskets shall contain aramid fibers bonded with styrene butadeine rubber (SBR) or nitrile butadeine rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.1.

2.2.2.3 Welded Connections

Welded valves and pipe connections (both butt-welds and socket-welds types) shall conform to ASME B31.9. Butt-welded fittings shall conform to ASME B16.9. Socket-welded fittings shall conform to ASME B16.11. Welded fittings shall be identified with the appropriate grade and marking symbol.

2.2.2.4 Dielectric Flanges

Provide dielectric flanges with a water-impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint. When dry, insulation barrier shall be able to withstand a 600-volt breakdown test. Provide dielectric flanges with the same pressure ratings as standard flanges and provide complete electrical isolation between connecting pipe and/or equipment.

2.3 COPPER TUBING

Provide copper tubing and fittings with a ANSI/ASME Class 125 service rating, which for 150 degrees F., the pressure rating is 175 psig.

2.3.1 Tube

Use copper tube conforming to ASTM B88, Type L for aboveground tubing.

2.3.2 Fittings and End Connections (Solder and Flared Joints)

Wrought copper and bronze solder joint pressure fittings, including unions

ands flanges, shall conform to ASME B16.22 and ASTM B75/B75M. Provide adapters as required. Cast copper alloy solder-joint pressure fittings, including unions and flanges, shall conform to ASME B16.18. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B62. ASTM B42 copper pipe nipples with threaded end connections shall conform to ASTM B42.

2.3.3 Solder

Provide solder in conformance with ASTM B32, grade Sb5, tin-antimony alloy. Solder flux shall be liquid or paste form, non-corrosive and conform to ASTM B813.

2.4 VALVES

Provide valves with a ANSI/ASME Class 125 service rating, which for 150 degrees F, the pressure rating is 175 psig.

2.4.1 Check Valve

Check valves 2-1/2 inches and smaller shall conform to MSS SP-80.

2.4.2 Butterfly Valve

Butterfly valves shall conform to MSS SP-67, Type 1 and shall be either the wafer or lug type. Valves smaller than 8 inches shall have throttling handles with a minimum of two locking positions. Valves 8 inches and larger shall have totally enclosed manual gear operators with adjustable balance return stops and position indicators.

2.4.3 Ball Valve

Full port design. Ball valves 1/2 inch and larger shall conform to MSS SP-72 or MSS SP-110 and shall be cast iron or bronze with threaded, soldered, or flanged ends. Ball valves may be provided in lieu of gate valves.

2.4.4 Automatic Balancing Valves

Copper alloy or cast iron body, copper alloy or stainless internal working parts. Provide valve with an internal cartridge capable of balancing to desired flow rate. Valve shall function as a service valve when in fully closed position. Valve shall be constructed with internal seals to prevent leakage and shall be supplied with preformed insulation.

Provide valve bodies with tapped openings and pipe extensions with positive shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable differential pressure meter connections to verify the pressure differential.

2.4.5 Calibrated Balancing Valves

Copper alloy or cast iron body, copper alloy or stainless internal working parts. Provide valve calibrated so that flow can be determined when the temperature and pressure differential across valve is known. Valve shall have an integral pointer which registers the degree of valve opening. Valve shall be constructed with internal seals to prevent leakage and shall be supplied with preformed insulation.

Provide valve bodies with tapped openings and pipe extensions with positive shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable differential pressure meter connections to verify the pressure differential. Provide metal tag on each valve showing the gallons per minute flow for each differential pressure reading. In lieu of the balancing valve with integral metering connections, a ball valve or plug valve with a separately installed orifice plate or venturi tube may be used for balancing.

2.4.6 Pressure Relief Valve

Valve shall prevent excessive pressure in the piping system when the piping system reaches its maximum heat buildup. Valve, ANSI Z21.22/CSA 4.4 and shall have cast iron bodies with corrosion resistant internal working parts. The discharge pipe from the relief valve shall be the size of the valve outlet unless otherwise indicated.

2.4.7 Drain Valves

Valves, MSS SP-72 or MSS SP-110 ball gate valves. Valve shall be manually operated, 3/4 inch pipe size and above with a threaded end connection. Provide valve with a water hose nipple adapter.

2.4.8 Air Venting Valves

Manually operated general service type air venting valves, brass or bronze valves that are furnished with threaded plugs or caps. Air venting valves on water coils shall have not less than 1/8 inch threaded end connections. Air venting valves on water mains shall have not less than 3/4 inch threaded end connections. Air venting valves on all other applications shall have not less than 1/2 inch threaded end connections.

2.5 PIPING ACCESSORIES

2.5.1 Strainer

Strainer, ASTM F1199, except as modified and supplemented in this specification. Strainer shall be the cleanable, basket or "Y" type, the same size as the pipeline. Strainer bodies shall be fabricated of cast iron with bottoms drilled, and tapped. Provide blowoff outlet with pipe nipple, gate valve, and discharge pipe nipple. The bodies shall have arrows clearly cast on the sides indicating the direction of flow.

Provide strainer with removable cover and sediment screen. The screen shall be made of minimum 22 gage corrosion-resistant steel, with small perforations numbering not less than 400 per square inch to provide a net-free area through the basket of at least 3.3 times that of the entering pipe. The flow shall be into the screen and out through the perforations.

2.5.2 Combination Strainer and Pump Suction Diffuser

Angle type body with removable strainer basket and internal straightening vanes, a suction pipe support, and a blowdown outlet and plug. Strainer shall be in accordance with ASTM F1199, except as modified and supplemented by this specification. Unit body shall have arrows clearly cast on the sides indicating the direction of flow.

Strainer screen shall be made of minimum 22 gage corrosion-resistant steel, with small perforations numbering not less than 400 per square inch to provide a net-free area through the basket of at least 3.3 times that of the entering pipe. Flow shall be into the screen and out through the perforations. Provide an auxiliary disposable fine mesh strainer which shall be removed 30 days after start-up. Provide warning tag for operator indicating scheduled date for removal.

Casing shall have connection sizes to match pump suction and pipe sizes, and be provided with adjustable support foot or support foot boss to relieve piping strains at pump suction. Provide unit casing with blowdown port and plug. Provide a magnetic insert to remove debris from system.

2.5.3 Flexible Pipe Connectors

Provide flexible bronze or stainless steel piping connectors with single braid. Equip flanged assemblies with limit bolts to restrict maximum travel to the manufacturer's standard limits. Unless otherwise indicated, the length of the flexible connectors shall be as recommended by the manufacturer for the service intended. Internal sleeves or liners, compatible with circulating medium, shall be provided when recommended by the manufacturer. Provide covers to protect the bellows where indicated.

2.5.4 Pressure and Vacuum Gauges

Gauges, ASME B40.100 with throttling type needle valve or a pulsation dampener and shut-off valve. Provide gauges with 4.5 inch dial, brass or aluminum case, bronze tube, and siphon. Gauge shall have a range from 0 psig to approximately 1.5 times the maximum system working pressure. Each gauge range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

2.5.5 Temperature Gauges

Temperature gauges shall be the industrial duty type and be provided for the required temperature range. Provide gauges with fixed thread connection, dial face gasketed within the case; and an accuracy within 2 percent of scale range. Gauges shall have Fahrenheit scale in 2 degree graduations scale (black numbers) on a white face. The pointer shall be adjustable. Rigid stem type temperature gauges shall be provided in thermal wells located within 5 feet of the finished floor. Universal adjustable angle type or remote element type temperature gauges shall be provided in thermal wells located 5 to 7 feet above the finished floor or in locations indicated. Remote element type temperature gauges shall be provided in thermal wells located 7 feet above the finished floor or in locations indicated.

2.5.5.1 Stem Cased-Glass

Stem cased-glass case shall be polished stainless steel or cast aluminum, 9 inches long, with clear acrylic lens, and non-mercury filled glass tube with indicating-fluid column.

2.5.5.2 Bimetallic Dial

Bimetallic dial type case shall be not less than 3-1/2 inches, stainless steel, and shall be hermetically sealed with clear acrylic lens. Bimetallic element shall be silicone dampened and unit fitted with external calibrator adjustment.

2.5.5.3 Liquid-, Solid-, and Vapor-Filled Dial

Liquid-, solid-, and vapor-filled dial type cases shall be not less than 3-1/2 inches, stainless steel or cast aluminum with clear acrylic lens. Fill shall be nonmercury, suitable for encountered cross-ambients, and connecting capillary tubing shall be double-braided bronze.

2.5.5.4 Thermal Well

Thermal well shall be identical size, 1/2 or 3/4 inch NPT connection, brass or stainless steel. Where test wells are indicated, provide captive plug-fitted type 1/2 inch NPT connection suitable for use with either engraved stem or standard separable socket thermometer or thermostat. Mercury shall not be used in thermometers. Extended neck thermal wells shall be of sufficient length to clear insulation thickness by 1 inch.

2.5.6 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, guides, and supports: to MSS SP-58 and MSS SP-69.

2.5.7 Escutcheons

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Secure plates in place by internal spring tension or set screws. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.6 PUMPS

Pumps shall be the electrically driven, non-overloading, centrifugal type which conform to HI 1.1-1.2. Pumps shall be selected at or within 5 percent of peak efficiency. Pump curve shall rise continuously from maximum capacity to shutoff. Pump motor shall conform to NEMA MG 1, be open, and have sufficient horsepower for the service required. Pump motor shall have the required capacity to prevent overloading with pump operating at any point on its characteristic curve. Pump speed shall not exceed 3,600 rpm, except where the pump head is less than 60 feet of water, the pump speed shall not exceed 1,750 rpm. Pump motor shall be equipped with a variable frequency drive as specified in Section 26 29 23 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

2.6.1 Construction

Each pump casing shall be designed to withstand the discharge head specified plus the static head on system plus 50 percent of the total, but not less than 125 psig. Pump casing and bearing housing shall be close grained cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Provide threaded suction and discharge pressure gage tapping with square-head plugs.

Impeller shall be statically and dynamically balanced. Impeller, impeller wearing rings, glands, casing wear rings, and shaft sleeve shall be bronze. Shaft shall be carbon or alloy steel, turned and ground. Bearings shall be ball-bearings, roller-bearings, or oil-lubricated bronze-sleeve type bearings, and be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water.

Close-coupled pump shall be provided with integrally cast or fabricated steel feet with bolt holes for securing feet to supporting surface. Close-coupled pumps shall be provided with drip pockets and tapped openings. Pump shall be accessible for servicing without disturbing piping connections. Shaft seals shall be mechanical-seals or stuffing-box type.

2.6.2 Mechanical Shaft Seals

Seals shall be single, inside mounted, end-face-elastomer bellows type with stainless steel spring, brass or stainless steel seal head, carbon rotating face, and tungsten carbide or ceramic sealing face. Glands shall be bronze and of the water-flush design to provide lubrication flush across the face of the seal. Bypass line from pump discharge to flush connection in gland shall be provided, with filter or cyclone particle separator in line.

2.7 ELECTRICAL WORK

Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Provide electrical equipment, including motors and wiring, as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown, shall be provided. For packaged equipment, the manufacturer shall provide controllers including the required monitors and timed restart.

Provide high efficiency type, single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11. Motors are to be inverter rated.

Provide polyphase, squirrel-cage medium induction motors, including motors that are part of a system, that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be rated for continuous duty with the enclosure specified. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and other necessary appurtenances. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of the enclosure.

Variable frequency drives for motors as specified in Section 26 29 23 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.2.8 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

2.8.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided. The

factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test.

Salt-spray fog test shall be in accordance with ASTM B117, and for that test, the acceptance criteria shall be as follows: Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of 0.125 inch on either side of the scratch mark. The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen.

If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

2.8.2 Shop Painting Systems for Metal Surfaces

Clean, retreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where hot-dip galvanized steel has been cut, resulting surfaces with no galvanizing shall be coated with a zinc-rich coating conforming to ASTM D520, Type I.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

a. Temperatures Less than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.

b. Temperatures Between 120 and 400 degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

2.9 FACTORY-APPLIED INSULATION

Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory-insulated items installed indoors shall have a flame spread index no higher than 25 and a smoke developed index no higher than 150. Factory-insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes shall be determined by ASTM E84.

Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by

a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E84.

2.10 NAMEPLATES

Major equipment including pumps, pump motors, expansion tanks, and air separator tanks shall have the manufacturer's name, type or style, model or serial number on a plate secured to the item of equipment. The nameplate of the distributing agent will not be acceptable. Plates shall be durable and legible throughout equipment life and made of anodized aluminum. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

2.11 RELATED COMPONENTS/SERVICES

2.11.1 Field-Applied Insulation

Requirements for field-applied insulation is specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.11.2 Field Painting

Requirements for painting of surfaces not otherwise specified, and finish painting of items only primed at the factory, are specified in Section 09 90 00 PAINTS AND COATINGS.

PART 3 EXECUTION

3.1 INSTALLATION

Cut pipe accurately to measurements established at the job site, and work into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation is not permitted without written approval. Cut pipe or tubing square, remove burrs by reaming, and fashion to permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

Notify the Contracting Officer in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

3.1.1 Welding

Provide welding work specified this section for piping systems in conformance with ASME B31.9, as modified and supplemented by this specification section and the accompanying drawings. The welding work includes: Qualification of welding procedures, welders, welding operators, and nondestructive examination personnel; maintenance of welding records, and examination methods for welds.

3.1.1.1 Employer's Record Documents (For Welding)

Submit for review and approval the following documentation. This

documentation and the subject qualifications shall be in compliance with ASME B31.9.

a. List of qualified welding procedures that is proposed to be used to provide the work specified in this specification section.

b. List of qualified welders, welding operators, and brazing operators that are proposed to be used to provide the work specified in this specification section.

c. List of qualified weld examination personnel that are proposed to be used to provide the work specified in this specification section.

3.1.1.2 Welding Procedures and Qualifications

a. Specifications and Test Results: Submit copies of the welding procedures specifications and procedure qualification test results for each type of welding required. Approval of any procedure does not relieve the Contractor of the responsibility for producing acceptable welds. Submit this information on the forms printed in ASME BPVC SEC IX or their equivalent.

b. Certification: Before assigning welders or welding operators to the work, submit a list of qualified welders, together with data and certification that each individual is performance qualified as specified. Do not start welding work prior to submitting welder, and welding operator qualifications. The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

3.1.1.3 Examination of Piping Welds

Conduct non-destructive examinations (NDE) on piping welds and brazing and verify the work meets the acceptance criteria specified in ASME B31.9. NDE on piping welds covered by ASME B31.9 is visual inspection only. Submit a piping welds NDE report meeting the requirements specified in ASME B31.9.

3.1.1.4 Welding Safety

Welding and cutting safety requirements shall be in accordance with AWS Z49.1.

3.1.2 Directional Changes

Make changes in direction with fittings. Mitering or notching pipe or other similar construction to form elbows or tees is not permitted.

3.1.3 Functional Requirements

Pitch horizontal supply mains down in the direction of flow as indicated. The grade shall not be less than 1 inch in 40 feet. Reducing fittings shall be used for changes in pipe sizes. Cap or plug open ends of pipelines and equipment during installation to keep dirt or other foreign materials out of the system.

Pipe not otherwise specified shall be uncoated. Connections to appliances shall be made with malleable iron unions for steel pipe 2-1/2 inches or

less in diameter, and with flanges for pipe 3 inches and above in diameter. Connections between ferrous and copper piping shall be electrically isolated from each other with dielectric waterways or flanges.

Piping located in air plenums shall conform to NFPA 90A requirements. Pipe and fittings installed in inaccessible conduits or trenches under concrete floor slabs shall be welded. Equipment and piping arrangements shall fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance. Electric isolation fittings shall be provided between dissimilar metals.

3.1.4 Fittings and End Connections

3.1.4.1 Threaded Connections

Threaded connections shall be made with tapered threads and made tight with PTFE tape complying with ASTM D3308 or equivalent thread-joint compound applied to the male threads only. Not more than three threads shall show after the joint is made.

3.1.4.2 Welded Connections

Branch connections shall be made with welding tees or forged welding branch outlets. Pipe shall be thoroughly cleaned of all scale and foreign matter before the piping is assembled. During welding, the pipe and fittings shall be filled with an inert gas, such as nitrogen, to prevent the formation of scale. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.9. Weld defects shall be removed and rewelded at no additional cost to the Government. Electrodes shall be stored and dried in accordance with AWS D1.1/D1.1M or as recommended by the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.4.3 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

3.1.4.4 Flanges and Unions

Except where copper tubing is used, union or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items. Flanged joints shall be assembled square end tight with matched flanges, gaskets, and bolts. Gaskets shall be suitable for the intended application.

3.1.5 Valves

Isolation ball valves shall be installed on each side of each piece of equipment, at the midpoint of all looped mains, and at any other points indicated or required for draining, isolating, or sectionalizing purpose. Isolation valves may be omitted where balancing cocks are installed to provide both balancing and isolation functions. Each valve except check valves shall be identified. Valves in horizontal lines shall be installed with stems horizontal or above.

3.1.6 Air Vents

Air vents shall be provided at all high points, on all water coils, and where indicated to ensure adequate venting of the piping system.

3.1.7 Drains

Drains shall be provided at all low points and where indicated to ensure complete drainage of the piping. Drains shall be accessible, and shall consist of nipples and caps or plugged tees unless otherwise indicated.

3.1.8 Flexible Pipe Connectors

Connectors shall be attached to components in strict accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the flexible pipe connector manufacturer and shall be provided at the intervals recommended.

3.1.9 Temperature Gauges

Temperature gauges shall be located on coolant supply and return piping at each heat exchanger and where indicated or required for proper operation of equipment. Thermal wells for insertion thermometers and thermostats shall extend beyond thermal insulation surface not less than 1 inch.

3.1.10 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as supplemented and modified in this specification section. Pipe hanger types 5, 12, and 26 shall not be used. Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Piping subjected to vertical movement, when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers.

3.1.10.1 Hangers

Type 3 shall not be used on insulated piping. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

3.1.10.2 Inserts

Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustments may be used if they otherwise meet the requirements for Type 18 inserts.

3.1.10.3 C-Clamps

Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

3.1.10.4 Angle Attachments

Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

3.1.10.5 Saddles and Shields

Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application. A high density insulation insert of cellular glass shall be used under the Type 40 shield for piping 2 inches and larger.

3.1.10.6 Horizontal Pipe Supports

Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.

3.1.10.7 Vertical Pipe Supports

Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 15 feet, not more than 8 feet from end of risers, and at vent terminations.

3.1.10.8 Pipe Guides

Type 35 guides using, steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

3.1.10.9 Steel Slides

Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 4 inches and larger, a Type 39 saddle shall be used. On piping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate.

3.1.10.10 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

3.1.10.11 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floors or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section. Material used for support shall be as specified under Section 05 12 00 STRUCTURAL STEEL.

3.1.11 Pipe Alignment Guides

Pipe alignment guides shall be provided where indicated for expansion

loops, offsets, and bends and as recommended by the manufacturer for expansion joints, not to exceed 5 feet on each side of each expansion joint, and in lines 4 inches or smaller not more than 2 feet on each side of the joint.

3.1.12 Pipe Anchors

Anchors shall be provided where indicated. Unless indicated otherwise, anchors shall comply with the requirements specified. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results using turnbuckles where required.

Supports, anchors, or stays shall not be attached where they will injure the structure or adjacent construction during installation or by the weight of expansion of the pipeline. Where pipe and conduit penetrations of vapor barrier sealed surfaces occur, these items shall be anchored immediately adjacent to each penetrated surface, to provide essentially zero movement within penetration seal.

3.1.13 Building Surface Penetrations

3.1.13.1 Fire-Rated Penetrations

Penetration of fire-rated walls, partitions, and floors shall be sealed as specified in Section 07 84 00 FIRESTOPPING.

3.1.13.2 Escutcheons

Finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms, shall be provided with escutcheons. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheon shall be secured to pipe or pipe covering.

3.1.14 Access Panels

Access panels shall be provided where indicated for all concealed valves, vents, controls, and additionally for items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

3.2 ELECTRICAL INSTALLATION

Install electrical equipment in accordance with NFPA 70 and manufacturer's instructions.

3.3 CLEANING AND ADJUSTING

Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. A temporary bypass shall be provided for all water coils to prevent flushing water from passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air

vents shall be plugged or capped after the system has been vented. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed.

3.4 FIELD TESTS

Field tests shall be conducted in the presence of the QC Manager or his designated representative to verify systems compliance with specifications. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor.

3.4.1 Equipment and Component Isolation

Prior to testing, equipment and components that cannot withstand the tests shall be properly isolated.

3.4.2 Pressure Tests

Each piping system shall be hydrostatically tested at a pressure not less than 188 psig for period of time sufficient to inspect every joint in the system and in no case less than 2 hours. Test pressure shall be monitored by a currently calibrated test pressure gauge. Leaks shall be repaired and piping retested until test requirements are met. No leakage or reduction in gage pressure shall be allowed.

Leaks shall be repaired by rewelding or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before concealing.

Submit for approval pressure tests reports covering the above specified piping pressure tests; describe the systems tested, test results, defects found and repaired, and signature of the pressure tests' director. Obtain approval from the QC Manager before concealing piping or applying insulation to tested and accepted piping.

3.4.3 Related Field Inspections and Testing

3.4.3.1 Piping Welds

Examination of Piping Welds is specified in the paragraph EXAMINATION OF PIPING WELDS (above).

3.4.3.2 HVAC TAB

Requirements for testing, adjusting, and balancing (TAB) of HVAC water piping, and associated equipment is specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Coordinate with the TAB team, and provide support personnel and equipment as specified in Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC to assist TAB team to meet the TAB work requirements.

3.5 INSTRUCTION TO GOVERNMENT PERSONNEL

Furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the heating-hot water. Instructors shall be thoroughly familiar with all parts of the installation and shall be instructed in operating theory as well as practical operation and maintenance work. Submit a lesson plan for the

instruction course for approval. The lesson plan and instruction course shall be based on the approved operation and maintenance data and maintenance manuals.

Conduct a training course for the operating staff and maintenance staff selected by the Contracting Officer. Give the instruction during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be one man-day. Use approximately half of the time for classroom instruction and the other time for instruction at the location of equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

-- End of Section --

SECTION 23 81 00.00 20

UNITARY AIR CONDITIONING EQUIPMENT
11/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

ANSI/AHRI 1060 I-P	(2013) Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Heat Equipment
AHRI 350	(2008) Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment
AHRI DCAACP	(Online) Directory of Certified Applied Air-Conditioning Products
AHRI DCUP	(Online) Directory of Certified Unitary Products
ANSI/AHRI 210/240	(2008; Add 1 2011; Add 2 2012) Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment
ANSI/AHRI 340/360	(2007; Addendum 1 2010; Addendum 2 2011) Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
ANSI/AHRI/CSA 310/380	(2014) Standard for Packaged Terminal Air-Conditioners and Heat Pumps

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2013; Addenda A 2014; ERTA 1 2014; ERTA 2 2015; INT 1 2015; ERTA 3 2015) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 52.2	(2012; Errata 2013; INT 1 2014; ADD A, B, AND D SUPP 2015; INT 3 2015; Errata 2 2015; ADD C 2015) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
ASHRAE 55	(2013; Errata 1 2014; Addenda A 2014; INT 1 2014; Errata 2-4 2014; Addenda B 2014;

	Errata 5 2014; Errata 6 2015; INT 2 2015; Errata 7 2015) Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1	(2010; Errata 2011; INT 3 2012; INT 4 2012; INT 5 2013) Ventilation for Acceptable Indoor Air Quality
ASHRAE 84	(2013; Addenda A 2013) Method of Testing Air-to-Air Heat Exchangers
ASHRAE 90.1-2010	Energy Standard for Buildings Except Low-Rise Residential Buildings, IP- Edition

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding

ASME INTERNATIONAL (ASME)

ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B31.5	(2013) Refrigeration Piping and Heat Transfer Components

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B280	(2013) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B88	(2014) Standard Specification for Seamless Copper Water Tube
ASTM D1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA MG 1	(2014) Motors and Generators

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50502	(Basic) Air Conditioners, (Unitary Heat Pump), Air to Air (3,000 to 300,000 BTU)

UNDERWRITERS LABORATORIES (UL)

UL 109	(1997; Reprint Aug 2013) Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service, and Marine Use
UL 484	(2014; Reprint Jul 2015) Standard for Room Air Conditioners
UL 900	(2015) Standard for Air Filter Units

1.2 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section with the additions and modifications specified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Field-Assembled Refrigerant Piping

Control System Wiring Diagrams

SD-03 Product Data

Packaged Terminal Units; G

Ductless Dedicated Outdoor Air Handling Unit; G

Split/System Heat Pumps; G

Filters

Thermostats

Refrigerant: Provide MSDS sheets for all refrigerants

Refrigerant Piping and Accessories

Coatings for Finned Tube Coils

SD-06 Test Reports

Salt-Spray Tests

Start-Up and Initial Operational Tests

SD-08 Manufacturer's Instructions

Packaged Terminal Units

Dedicated Outdoor Air Handling Unit

Ductless Split/System Heat Pumps

Filters

Thermostats

Refrigerant Piping and Accessories

SD-10 Operation and Maintenance Data

Packaged Terminal Units, Data Package 3

Dedicated Outdoor Air Handling Unit, air to air, Data Package 3

Ductless Split/System Heat Pumps, Data Package 3

Filters, Data Package 2

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Posted Operating Instructions

1.4 QUALITY ASSURANCE

1.4.1 Modification of References

Accomplish work in accordance with the referenced publications, except as modified by this section. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to "the Authority having jurisdiction," "the Administrative Authority," "the Owner," or "the Design Engineer" to mean the Contracting Officer.

1.4.2 Detail Drawing

For refrigerant piping, submit piping, including pipe sizes. Submit

control system wiring diagrams.

1.4.3 Safety

Design, manufacture, and installation of unitary air conditioning equipment shall conform to ANSI/ASHRAE 15 & 34.

1.4.4 Posted Operating Instructions

Submit posted operating instructions for each packaged air conditioning unit.

1.4.5 Sizing

Size equipment based on Design Manual CS from the Air Conditioning Contractors of America; do not oversize.

1.5 REFRIGERANTS

Refrigerants shall have an Ozone Depletion Potential (ODP) of 0.0. The ODP shall be in accordance with the "Montreal Protocol On Substances That Deplete The Ozone Layer," September 1987, sponsored by the United Nations Environment Programme. CFCs and HCFCs and Halons shall not be permitted. Refrigerant shall be an approved alternative refrigerant per EPA's Significant New Alternative Policy (SNAP) listing.

1.6 ENVIRONMENTAL REQUIREMENTS

For proper Indoor Environmental Quality, maintain positive pressure within the building. Ventilation shall meet or exceed ASHRAE 62.1 and all published addenda. Meet or exceed filter media efficiency as tested in accordance with ASHRAE 52.2. Thermal comfort shall meet or exceed ASHRAE 55.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Energy Efficient Equipment for Unitary Air Conditioning Equipment

Provide unitary air conditioning equipment meeting the efficiency requirements as stated within this section.

2.1.2 Ozone Depleting Substances

Unitary air conditioning equipment must not use CFC-based refrigerants, and must have an Ozone Depletion Potential (ODP) no greater than 0.0, with exception to R-123, in conformance with this section.

2.2 PACKAGED TERMINAL UNITS

2.2.1 Heat Pumps (PTHP)

ANSI/AHRI/CSA 310/380, UL 484, air-cooled, thru-wall type, AHRI certified, and UL listed. Heat pumps shall have a minimum energy efficiency ratio (EER), a minimum Coefficient of Performance (COP), and a minimum

integrated part load value (IPLV) that meet ASHRAE 90.1-2010 minimum requirements. Provide units listed in AHRI DCAACP. The unit shall be suitable for seacoast applications.

2.2.2 Indoor Noise Rating

Rate in accordance with AHRI 350. Indoor rating shall not exceed 30 bels while entire unit is operating at any fan or compressor speed.

2.2.3 Room Cabinets

Fabricate of 18-gage minimum steel (MSS). Provide removable front panel and access panels for equipment machinery, coils, controls, and filters. In lieu of steel, front panel may be constructed of high impact styrene structural foam conforming to requirements of UL 484. Structural foam shall pass tests specified in UL 484 for classification of 94 HB. Line interior of steel cabinets with insulation having a fire hazard rating not exceeding 25 for flame spread, and 50 for smoke developed, as determined by ASTM E84. Caulk around floor mounted units at the floor. Locate wall-mounted units 2-1/2 inches minimum above the floor.

2.2.4 Grilles

Provide manufacturer's architectural anodized aluminum outdoor grilles and caulk and seal on all sides when required by manufacturer's instructions. Provide both horizontal and vertical adjustable deflection inside air supply grilles. Provide for air return under the front panel or a return air grille in the lower part of the front panel.

2.2.5 Wall Sleeves and Mounts

Provide manufacturer's standard wall sleeves and mounts. Wall sleeves shall have seals designed to restrict driving rain and wind. Provide unit subbase of the same construction and finish as the sleeve to provide for concealed electrical connection, cord storage, and equipped with unit leveling legs. Provide subbase with 24-volt remote control circuitry and wall mounted thermostat.

2.2.6 Heating Section for PTHP

a. Hot Water Coils: Serpentine type constructed of seamless copper tubes with aluminum fins mechanically or hydraulically bonded to tubes. Provide factory-furnished tee and manual air vent on return connection. Factory test coils at twice maximum operating pressure.

b. Heating unit shall have internal thermal insulation having a fire hazard rating not to exceed 25 for flame spread and 50 for smoke developed as determined by ASTM E84.

2.2.7 Refrigeration Sections

Completely self-contained, slide-in assembly or removable chassis with welded, hermetically sealed, air-cooled refrigeration system, outdoor fan, indoor fan, and control box. Provide refrigeration sections capable of installation or removal without the use of tools. Refrigeration sections shall include refrigeration circuit tubing, wiring, and safety controls, and shall operate down to 35 degrees F outdoor temperature and 70 degrees F indoor temperature, without compressor short cycling while delivering not less than 100 percent of rated cooling capacity. Units shall have drains

to the building exterior to eliminate excess driving rain. Provide auxiliary drain to allow excessive moisture in pan to exterior.

a. Compressors: Hermetic type with vibration isolation devices.

b. Coils: Constructed of seamless copper or aluminum tubing with copper or aluminum fins bonded to tubes. Coat outdoor air coils with factory applied corrosion resistant treatment for seacoast applications. Coils to be coated shall be part of manufacturer's standard product for capacities and ratings indicated and specified. Provide plate type fins.

c. Outdoor Fans: Direct connected centrifugal type with aluminum or plastic wheel and forward curved blades or direct connected aluminum propeller type. Design fans so that condensate will evaporate without drip, splash, or spray on building exterior.

d. Indoor Fans: Direct connected centrifugal type with aluminum, galvanized steel, or plastic wheel and forward curved blades. Provide minimum two-speed motor with built-in overload protection.

2.2.8 Air Filters

Removable without use of tools, and shall filter both recirculated and ventilating air.

2.2.9 Controls

Provide controls including, an adjustable remotely mounted thermostat, and switches, to regulate room air temperature through control of refrigerant compressors or heating elements. Controls shall at least have positions for off, high or low fan speed for heating and cooling, and fan only operation. Thermostat shall be able to be limited to a user range of 65 to 78 degrees F.

2.3 DEDICATED OUTDOOR AIR HANDLING UNITS

Provide a modular indoor dedicated outside air handling unit. Unit casing shall be double wall construction with foam insulation with a minimum R-7 rating. Unit casing shall be painted galvanized steel and shall be able to withstand at least 3,000 hours of a salt spray testing (ASTM B117). Unit shall be provided with energy recovery wheel as indicated in paragraph ENERGY RECOVERY. Supply fan and exhaust fan shall be direct drive plenum fan or belt driven backward inclined type. Condensate drain pan shall be double sloped stainless steel. Unit shall have double walled hinged access doors, unit shall have filters as indicated in paragraph FILTERS. Indoor unit shall be provided with separate split condenser, and refrigerant piping kit.

2.3.1 Energy Performance

Minimum energy performance shall be in accordance with ASHRAE 90.1-2010.

2.3.2 Coils

Extended-surface fin and tube type with seamless copper with aluminum fins securely bonded to the tubes. Provide a coating on coils as specified in the paragraph COATINGS FOR FINNED TUBE COILS. Coils to be coated shall be part of manufacturer's standard product for capacities and ratings

indicated and specified. Provide plate type fins.

2.3.3 Air Cooled Condenser

Unit casing shall be painted galvanized steel and shall be able to withstand at least 3,000 hours of a salt spray testing (ASTM B117). Compressors shall be scroll type and shall have variable capacity ability. Condenser fans are to be ECM or VFD driven for variable speed. Compressor shall have ability to provide cooling, heat pump heating, and hot gas reheat. Unit shall utilize R410 refrigerant.

2.3.4 Mounting Provisions

Provide units that permit mounting as indicated. Provide suitable lifting attachment plates to enable equipment to be lifted to normal position.

2.3.5 Temperature Controls

Provide unit mounted control panel. Internal unit controls shall be able to control fan speed, DX cooling/heat pump/hot gas reheat, heating hot water valve output to satisfy the temperature controls. The unit mounted control panel shall be BACnet capable.

2.3.6 Accessories

Provide the following accessories for dedicated packaged outdoor air units.

a. Unit-mounted variable speed drive or ECM motor to control fan speed.

b. Unit shall be provided with internal controls and shall be able to provide functionality indicated on control drawings.

c. Modulating heating hot water control valve.

d. Supply and exhaust fans are to be provided with piezo rings or other suitable means for outside and exhaust airflow measurement.

2.4 DUCTLESS SPLIT/SYSTEM HEAT PUMP

2.4.1 Ductless Split/System Heat Pump

Provide separate assemblies designed to be used together. Base ratings on the use of matched assemblies. Provide performance diagrams for units with capacities not certified by AHRI to verify that components of the air conditioning system furnished will satisfy the capacity requirement specified or indicated. Units shall have an ASHRAE 90.1-2010 minimum energy efficiency when tested in accordance with ANSI/AHRI 210/240 or ANSI/AHRI 340/360 as applicable. List units with capacities smaller than 135,000 Btu/hr in the AHRI DCUP; in lieu of listing in the AHRI Directory, a letter of certification from AHRI that units have been certified and will be listed in the next Directory will be acceptable. Provide capacity, electrical characteristics and operating conditions as indicated.

Provide inverter driven ductless split/system heat pumps with outdoor condenser and indoor high wall evaporator. Outdoor condenser coil is to be coated with corrosion resistant coating in accordance with paragraph COATINGS FOR FINNED TUBE COILS. Indoor high wall evaporator is to have multiple fan speeds. Unit is to be provided with wall-mounted thermostat. Split/System heat pump shall have 100 percent heating

capacity at 0 degrees F ambient. Provide with factory refrigerant line kit. Units are to have R410A refrigerant.

2.5 FILTERS

Provide replaceable (throw-away) pre and final filters for dedicated outdoor air system and cleanable (reusable) type for packaged terminal heat pumps units and ductless split/system heat pumps. Filters shall conform to UL 900, Class 1 or Class 2. Polyurethane filters shall not be used on units with multiframe filters.

2.5.1 Replaceable Type Filters

Throw-away frames and media, standard dust holding capacity, 500 fpm maximum face velocity, and one inch 2 inches thick. Pre and final filters shall have a minimum efficiency reporting value (MERV) of 8 and 13 respectively when tested in accordance with ASHRAE 52.2.

2.5.2 Cleanable Type Filters

Provide sufficient oil to coat filters six times based on 1 pint of oil per each 10 square feet of filter area. Provide washing and charging tanks for cleaning and coating filters. Filters shall have a MERV of 6 when tested in accordance with ASHRAE 52.2.

2.6 COATINGS FOR FINNED TUBE COILS

Where stipulated in equipment specifications of this section, coat finned tube coils of the affected equipment as specified below. Apply coating at the premises of a company specializing in such work. Degrease and prepare for coating in accordance with the coating applicator's procedures for the type of metals involved. Completed coating shall show no evidence of softening, blistering, cracking, crazing, flaking, loss of adhesion, or "bridging" between the fins.

2.6.1 Phenolic Coating

Provide a resin base thermosetting phenolic coating. Apply coating by immersion dipping of the entire coil. Provide a minimum of two coats. Bake or heat dry coils following immersions. After final immersion and prior to final baking, spray entire coil with particular emphasis given to building up coating on sheared edges. Total dry film thickness shall be 2.5 to 3.0 mils. Coating shall meet salt-test requirements listed in paragraph Salt-Spray Tests.

2.7 MOTORS AND STARTERS

NEMA MG 1, NEMA ICS 1, and NEMA ICS 2. Variable speed. Motors less than 1 hp shall meet NEMA High Efficiency requirements. Motors 1 hp and larger shall meet NEMA Premium Efficiency requirements. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters. Provide motors to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating. Motor size shall be sufficient for the duty to be performed and shall not exceed its full load nameplate current rating when driven equipment is operated at specified capacity under the most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, and branch circuit

protection to accommodate equipment actually provided. Provide unit-mounted disconnect.

2.8 ENERGY RECOVERY

a. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE 84 and ANSI/AHRI 1060 I-P. Cassettes shall be listed in the AHRI Certified Products Directory and bear the AHRI Certified Product Seal. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

b. Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

c. The wheel shall be wound continuously with one flat and one structured layer in a parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.

d. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment. Wheels 25 inches in diameter and greater shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.

e. Unit shall include energy recovery wheel defrost control which includes an adjustable temperature sensor and timer wired to periodically stop the wheel rotation, which allows the warm exhaust air to defrost the wheel.

2.8.1 Fittings

ASME B16.22 for solder-joint fittings. UL 109 for flared tube fittings.

2.8.2 Brazing Filler Material

AWS A5.8/A5.8M.

2.8.3 Pipe Hangers and Supports

MSS SP-69 and MSS SP-58, Type 1, except as indicated otherwise.

2.8.4 Pipe Sleeves

Provide sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 0.25 inch space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation and caulk at both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

2.8.4.1 Sleeves in Masonry and Concrete Walls, Floors, and Roofs

Provide Schedule 40 or Standard Weight zinc-coated steel pipe.

2.9 REFRIGERANT PIPING AND ACCESSORIES

Provide accessories as specified in CID A-A-50502 and this section. Provide suction line accumulators as recommended by equipment manufacturer's installation instructions. Provide filter-drier as recommended by manufacturer.

2.9.1 Field-Assembled Refrigerant Piping

Material and dimensional requirements for field-assembled refrigerant piping, valves, fittings, and accessories shall conform to ANSI/ASHRAE 15 & 34 and ASME B31.5, except as herein specified. Factory clean, dehydrate, and seal piping before delivery to the project location. Provide seamless copper tubing, hard drawn, Type ACR, conforming to ASTM B88, except that tubing with outside diameters of 1/4 inch and 3/8 inch shall have nominal wall thickness of not less than 0.030 inch and 0.032 inch, respectively. Soft annealed copper tubing conforming to ASTM B280 may be used where flare connections to equipment are required only in nominal sizes less than 1 inch outside diameter.

2.9.2 Fittings

ASME B16.22 for solder-joint fittings. UL 109 for flared tube fittings.

2.9.3 Pipe Hangers and Supports

MSS SP-69 and MSS SP-58, Type 1, except as indicated otherwise.

2.9.4 Pipe Sleeves

Provide sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 0.25 inch space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation and caulk at both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

2.9.4.1 Sleeves in Masonry and Concrete Walls, Floors, and Roofs

Provide Schedule 40 or Standard Weight zinc-coated pipe sleeves. Extend sleeves in floor slabs 3 inches above finished floor.

2.10 FINISHES

Provide steel surfaces of equipment including packaged terminal units, heat pumps, and air conditioners, that do not have a zinc coating conforming to ASTM A123/A123M, or a duplex coating of zinc and paint, with a factory applied coating or paint system. Provide a coating or paint system on actual equipment identical to that on salt-spray test specimens with respect to materials, conditions of application, and dry-film thickness.

2.11 SOURCE QUALITY CONTROL

2.11.1 Salt-Spray Tests

Salt-spray test the factory-applied coating or paint system of equipment including dedicated packaged outdoor air unit and ductless split-system heat pumps in accordance with ASTM B117. Conduct test for 3,000 hours for equipment installed outdoors, or 125 hours for equipment installed indoors. Test specimens shall have a standard scribe mark as defined in ASTM D1654. Upon completion of exposure, evaluate and rate the coating or paint system in accordance with procedures A and B of ASTM D1654. Rating of failure at the scribe mark shall not be less than six, average creepage not greater than 1/8 inch. Rating of the unscribed area shall not be less than 10, no failure.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

Install equipment and components in a manner to ensure proper and sequential operation of equipment and equipment controls. Install equipment not covered in this section, or in manufacturer's instructions, as recommended by manufacturer's representative. Provide proper foundations for mounting of equipment, accessories, appurtenances, piping and controls including, but not limited to, supports, vibration isolators, stands, guides, anchors, clamps and brackets. Foundations for equipment shall conform to equipment manufacturer's recommendation, unless otherwise indicated. Set anchor bolts and sleeves using templates. Provide anchor bolts of adequate length, and provide with welded-on plates on the head end embedded in the concrete. Level equipment bases, using jacks or steel wedges, and neatly grout-in with a nonshrinking type of grouting mortar. Locate equipment to allow working space for servicing including shaft removal, disassembling compressor cylinders and pistons, replacing or adjusting drives, motors, or shaft seals, access to water heads and valves of shell and tube equipment, tube cleaning or replacement, access to automatic controls, refrigerant charging, lubrication, oil draining and working clearance under overhead lines. Provide electric isolation between dissimilar metals for the purpose of minimizing galvanic corrosion.

3.1.1 Packaged Terminal Heat Pumps

Wall sleeve installation shall provide a positive weathertight and airtight seal.

3.1.2 Dedicated Outside Air Handling Unit

Install as indicated, in accordance with requirements of ANSI/ASHRAE 15 & 34, and the manufacturer's installation and operational instructions.

3.1.3 Split/System Heat Pump

Install as indicated, in accordance with requirements of ANSI/ASHRAE 15 & 34, and the manufacturer's installation and operational instructions.

3.2 PIPING

Brazing, bending, forming and assembly of refrigerant piping shall conform to ASME B31.5.

3.2.1 Pipe Hangers and Supports

Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP-58. Installation of hanger types and supports for bare and covered pipes shall conform to MSS SP-69 for the system temperature range. Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MSS SP-58.

3.2.2 Refrigerant Piping

Cut pipe to measurements established at the site and work into place without springing or forcing. Install piping with sufficient flexibility to provide for expansion and contraction due to temperature fluctuation. Where pipe passes through building structure pipe joints shall not be concealed, but shall be located where they may be readily inspected. Install piping to be insulated with sufficient clearance to permit application of insulation. Install piping as indicated and detailed, to avoid interference with other piping, conduit, or equipment. Except where specifically indicated otherwise, run piping plumb and straight and parallel to walls and ceilings. Trapping of lines will not be permitted except where indicated. Provide sleeves of suitable size for lines passing through building structure. Braze refrigerant piping with silver solder complying with AWS A5.8/A5.8M. Inside of tubing and fittings shall be free of flux. Clean parts to be jointed with emery cloth and keep hot until solder has penetrated full depth of fitting and extra flux has been expelled. Cool joints in air and remove flame marks and traces of flux. During brazing operation, prevent oxide film from forming on inside of tubing by slowly flowing dry nitrogen through tubing to expel air. Make provisions to automatically return oil on halocarbon systems. Installation of piping shall comply with ASME B31.5.

3.2.3 Returning Oil from Refrigerant System

Install refrigerant lines so that gas velocity in the evaporator suction line is sufficient to move oil along with gas to the compressor. Where equipment location requires vertical risers, line shall be sized to maintain sufficient velocity to lift oil at minimum system loading and corresponding reduction of gas volume. Install a double riser when excess velocity and pressure drop would result from full system loading. Larger riser shall have a trap, of minimum volume, obtained by use of 90- and 45-degree ells. Arrange small riser with inlet close to bottom of horizontal line, and connect to top of upper horizontal line. Do not

install valves in risers.

3.2.4 Refrigerant Driers, Sight Glass Indicators, and Strainers

Provide refrigerant driers, sight glass liquid indicators, and strainers in refrigerant piping in accordance with CID A-A-50502 when not furnished by the manufacturer as part of the equipment. Install driers in liquid line with service valves and valved bypass line the same size as liquid line in which dryer is installed. Size of driers shall be determined by piping and installation of the unit on location. Install dryers of 50 cubic inches and larger vertically with the cover for removing cartridge at the bottom. Install moisture indicators in the liquid line downstream of the drier. Indicator connections shall be the same size as the liquid line in which it is installed.

3.2.5 Strainer Locations and Installation

Locate strainers close to equipment they are to protect. Provide a strainer in common refrigerant liquid supply to two or more thermal valves in parallel when each thermal valve has a built-in strainer. Install strainers with screen down and in direction of flow as indicated on strainer's body.

3.2.6 Solenoid Valve Installation

Install solenoid valves in horizontal lines with stem vertical and with flow in direction indicated on valve. If not incorporated as integral part of the valve, provide a strainer upstream of the solenoid valve. Provide service valves upstream of the solenoid valve, upstream of the strainer, and downstream of the solenoid valve. Remove the internal parts of the solenoid valve when brazing the valve.

3.3 AUXILIARY DRAIN PANS, DRAIN CONNECTIONS, AND DRAIN LINES

Provide auxiliary drain pans under units located above finished ceilings or over mechanical or electrical equipment where condensate overflow will cause damage to ceilings, piping, and equipment below. Provide separate drain lines for the unit drain and auxiliary drain pans. Trap drain pans from the bottom to ensure complete pan drainage. Provide drain lines full size of drain opening. Traps and piping to drainage disposal points shall conform to Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.4 ACCESS PANELS

Provide access panels for concealed valves, controls, dampers, and other fittings requiring inspection and maintenance.

3.5 AIR FILTERS

Allow access space for servicing filters. Install filters with suitable sealing to prevent bypassing of air.

3.6 FLASHING AND PITCH POCKETS

Provide flashing and pitch pockets for equipment supports and roof penetrations and flashing where piping or ductwork passes through exterior walls in accordance with Section 07 60 00 FLASHING AND SHEET METAL.

3.7 IDENTIFICATION TAGS AND PLATES

Provide equipment, gauges, thermometers, valves, and controllers with tags numbered and stamped for their use. Provide plates and tags of brass or suitable nonferrous material, securely mounted or attached. Provide minimum letter and numeral size of 1/8 inch high.

3.8 FIELD QUALITY CONTROL

3.8.1 Leak Testing

Upon completion of installation of air conditioning equipment, test factory- and field-installed refrigerant piping with an electronic-type leak detector. Use same type of refrigerant to be provided in the system for leak testing. When nitrogen is used to boost system pressure for testing, ensure that it is eliminated from the system before charging. Minimum refrigerant leak field test pressure shall be as specified in ANSI/ASHRAE 15 & 34, except that test pressure shall not exceed 150 psig on hermetic compressors unless otherwise specified as a low side test pressure on the equipment nameplate. If leaks are detected at time of installation or during warranty period, remove the entire refrigerant charge from the system, correct leaks, and retest system.

3.8.2 Evacuation, Dehydration, and Charging

After field charged refrigerant system is found to be without leaks or after leaks have been repaired on field-charged and factory-charged systems, evacuate the system using a reliable gauge and a vacuum pump capable of pulling a vacuum of at least 1 mm Hg absolute. Evacuate system in accordance with the triple-evacuation and blotter method or in accordance with equipment manufacturer's printed instructions and recharge system.

3.8.3 Start-Up and Initial Operational Tests

Test the air conditioning systems and systems components for proper operation. Adjust safety and automatic control instruments as necessary to ensure proper operation and sequence. Conduct operational tests for not less than 8 hours.

3.8.4 Performance Tests

Upon completion of evacuation, charging, startup, final leak testing, and proper adjustment of controls, test the systems to demonstrate compliance with performance and capacity requirements. Test systems for not less than 8 hours, record readings hourly. At the end of the test period, average the readings, and the average shall be considered to be the system performance.

-- End of Section --

SECTION 23 82 00.00 20

TERMINAL HEATING AND COOLING UNITS
11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 33	(2000) Method of Testing Forced Circulation Air Cooling and Air Heating Coils

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA MG 1	(2014) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

1.2 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section with additions and modifications specified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Unit Heaters; G

Cabinet Unit Heaters; G

SD-10 Operation and Maintenance Data

Unit Heaters, Data Package 2

Cabinet Unit Heaters; Data Package 2

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 CABINET UNIT HEATERS AND UNIT HEATERS

Self-contained and factory assembled, propeller fan for unit heaters and centrifugal fans for cabinet unit heaters with capacities expressed as Btu per hour output and cubic foot-per-minute air delivery, operating conditions, and mounting arrangements as indicated. Average fan bearing life must be minimum 200,000 hours at operating conditions. Provide fan motor with direct drive. Construct fan-guard motor mount of steel wire. Equip each heater with individually adjustable package discharge louver. Louvers may be substituted by discharge cones or diffusers. Provide wall-mounted thermostats with the unit. Furnish circuit breaker disconnect switch.

2.1.1 Hot-Water Unit Heater

ASHRAE 33 tested for heating coils; UL listed for motor and controls.

2.1.1.1 Casing

Minimum 20 gage steel with removable access panels or means to remove, service, and maintain major components.

2.1.1.2 Coil

Fin-and-tube coil constructed of copper tubes and aluminum fins. Use maximum design pressure of hot water at 200 psig and degrees325 F.

2.1.1.3 Controls

Automatic controls of modulating.

2.2 FAN

Provide aluminum fans with ball or roller bearings for motors over 1/8 horsepower (hp) and sleeve bearings for motors 1/8 hp and under. Provide

sleeve bearings with oil reservoir, if not permanently lubricated.

2.3 MOTOR AND STARTER

NEMA MG 1, and NEMA ICS 2, and NEMA ICS 6, respectively. Provide continuous-duty motor with built-in automatic reset thermal overload protection. For motor 1/2 hp and larger, use three-phase. Provide single-phase motor of permanent split capacitor or capacitor start. Limit motor speed at 1800 rpm. Wire motor to heater power supply source.

2.4 SOURCE QUALITY CONTROL

Special protection is not required for equipment that has a zinc coating conforming to ASTM A123/A123M. Otherwise, protect affected equipment items by manufacturers' corrosion-inhibiting coating or paint system that has proved capable of withstanding salt-spray test in accordance with ASTM B117. Test indoor and outdoor equipment for 125 hours; test outdoor equipment used in a marine atmosphere for 500 hours. For each specimen, perform a scratch test as defined in ASTM D1654.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment where indicated and as recommended by manufacturer's recommendations, NFPA 90A.

3.1.1 Electrical Work

NFPA 70 and Division 16, "Electrical Work." When replacing original control wires, provide No. 16 AWG with minimum 105 degrees C insulation.

3.2 FIELD QUALITY CONTROL

Administer, schedule, and conduct specified tests. Furnish personnel, instruments and equipment for such tests. Correct defects and repeat the respective inspections and tests. Conduct inspections and testing in the presence of the Contracting Officer.

3.2.1 Test Instruments and Apparatus

Provide instruments and apparatus currently certified as being accurate to within one percent of their full scale. Use gages with a maximum scale between 1 1/2 and 2 times test pressure.

3.2.2 Field Inspection

Prior to initial operation, inspect equipment installation to ensure that indicated and specified requirements have been met.

-- End of Section --

SECTION 26 00 00.00 20

BASIC ELECTRICAL MATERIALS AND METHODS
07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013; INT 8 2014) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2014) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to certain sections of Division 02, EXISTING CONDITIONS and Divisions 22 and 23, PLUMBING and HEATING VENTILATING AND AIR CONDITIONING. This section applies to all sections of Division 26 and 33, ELECTRICAL and UTILITIES, of this project specification unless specified otherwise in the individual sections. This section has been incorporated into, and thus, does not apply to, and is not referenced in the following sections.

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

Section 26 24 13 SWITCHBOARDS.

Section 26 51 00.00 22 INTERIOR LIGHTING.

Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

1.3 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 208 volts, three phase, four wire, 60 Hz. Final connections to the power distribution system at the existing transformer shall be made by the Contractor as directed by the utility company.

1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

1.5.1 Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers

regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.6.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6, 000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

b. Startup, proper adjustment, operating, lubrication, and shutdown procedures.

c. Safety precautions.

d. The procedure in the event of equipment failure.

e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.9 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.11 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.12 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

PART 2 PRODUCTS

2.1 FACTORY-APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 FIELD-APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.2 FIELD-FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two

sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM
02/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B1	(2013) Standard Specification for Hard-Drawn Copper Wire
ASTM B8	(2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D709	(2013) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013; INT 8 2014) National Electrical Safety Code

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2013) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2005) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2005) American National Standard for Electrical Metallic Tubing (EMT)
ANSI C80.5	(2005) American National Standard for Electrical Rigid Aluminum Conduit
NEMA 250	(2014) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA FU 1	(2012) Low Voltage Cartridge Fuses

NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2010) Terminal Blocks
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA KS 1	(2013) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA MG 1	(2014) Motors and Generators
NEMA MG 10	(2013) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors
NEMA RN 1	(2005; R 2013) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(2013) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2013) Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA VE 1	(2009) Standard for Metal Cable Tray Systems
NEMA WD 1	(1999; R 2005; R 2010) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2012) Wiring Devices Dimensions Specifications
NEMA Z535.4	(2011) American National Standard for Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 70E	(2015) Standard for Electrical Safety in

	the Workplace
NFPA 780	(2014) Standard for the Installation of Lightning Protection Systems

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.1	(2009; Add 2 2011; Add 1 2012) Commercial Building Telecommunications Cabling Standard
TIA-569	(2012c; Addendum 1 2013; Errata 2013) Commercial Building Standard for Telecommunications Pathways and Spaces
TIA-607	(2011b) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jul 2012) Standard for Flexible Metal Conduit
UL 1063	(2006; Reprint Jul 2012) Machine-Tool Wires and Cables
UL 1242	(2006; Reprint Mar 2014) Standard for Electrical Intermediate Metal Conduit -- Steel
UL 1449	(2014) Surge Protective Devices
UL 1569	(2014) Standard for Metal-Clad Cables
UL 1699	(2006; Reprint Nov 2013) Arc-Fault Circuit-Interrupters
UL 198M	(2003; Reprint Feb 2013) Standard for Mine-Duty Fuses
UL 20	(2010; Reprint Feb 2012) General-Use Snap Switches
UL 360	(2013; Reprint Jan 2015) Liquid-Tight Flexible Steel Conduit
UL 4248-1	(2007; Reprint Oct 2013) UL Standard for Safety Fuseholders - Part 1: General Requirements
UL 4248-12	(2007; Reprint Dec 2012) UL Standard for Safety Fuseholders - Part 12: Class R

UL 44	(2014; Reprint Feb 2015) Thermoset-Insulated Wires and Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2013; Reprint Feb 2014) Wire Connectors
UL 486C	(2013; Reprint Feb 2014) Splicing Wire Connectors
UL 489	(2013; Reprint Mar 2014) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(2012; Reprint Oct 2014) Attachment Plugs and Receptacles
UL 5	(2011) Surface Metal Raceways and Fittings
UL 50	(2007; Reprint Apr 2012) Enclosures for Electrical Equipment, Non-environmental Considerations
UL 506	(2008; Reprint Oct 2013) Specialty Transformers
UL 508	(1999; Reprint Oct 2013) Industrial Control Equipment
UL 510	(2005; Reprint Jul 2013) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	(2013) Metallic Outlet Boxes
UL 514B	(2012; Reprint Nov 2014) Conduit, Tubing and Cable Fittings
UL 514C	(2014; Reprint Dec 2014) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2007; Reprint Nov 2014) Electrical Rigid Metal Conduit-Steel
UL 67	(2009; Reprint Nov 2014) Standard for Panelboards
UL 6A	(2008; Reprint Nov 2014) Electrical Rigid Metal Conduit - Aluminum, Red Brass, and Stainless Steel
UL 797	(2007; Reprint Dec 2012) Electrical Metallic Tubing -- Steel
UL 817	(2001; Reprint Jul 2014) Standard for Cord Sets and Power-Supply Cords
UL 83	(2014) Thermoplastic-Insulated Wires and

	Cables
UL 869A	(2006) Reference Standard for Service Equipment
UL 870	(2008; Reprint Feb 2013) Standard for Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(2006; Reprint Jun 2012) Ground-Fault Circuit-Interrupters
UL 984	(1996; Reprint Sep 2005) Hermetic Refrigerant Motor-Compressors

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00.

SD-02 Shop Drawings

Panelboards; G

Cable trays; G

SD-03 Product Data

Receptacles; G

Circuit breakers; G

Switches; G

Enclosed circuit breakers; G

CATV outlets; G

Telecommunications Grounding Busbar; G

Surge protective devices; G

Include performance and characteristic curves.

SD-06 Test Reports

600-volt wiring test; G

Grounding system test; G

Ground-fault receptacle test; G

SD-07 Certificates

Fuses; G

SD-09 Manufacturer's Field Reports

Transformer factory tests

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5; G

Submit operation and maintenance data in accordance with Section 01 78 23, OPERATION AND MAINTENANCE DATA and as specified herein.

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in paragraph, FUSES of this section.

1.4.2 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.3.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6, 000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.3.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable.

1.5 WARRANTY

Provide equipment items supported by service organizations that are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

As a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

2.2 CONDUIT AND FITTINGS

Conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6.

2.2.1.2 Rigid Aluminum Conduit

ANSI C80.5, UL 6A.

2.2.2 Rigid Nonmetallic Conduit

PVC Type EPC-40, and EPC-80 in accordance with NEMA TC 2.

2.2.3 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, ANSI C80.3.

2.2.5 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40 (40 mils thick).

2.2.6 Flexible Metal Conduit

UL 1.

2.2.6.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

2.2.7 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings: Cadmium- or zinc-coated in accordance with UL 514B.

2.2.7.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.7.2 Fittings for EMT

Steel compression type.

2.2.8 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3 for PVC and UL 514B.

2.3 SURFACE RACEWAY

2.3.1 Surface Metal Raceway

UL 5, two-piece painted steel, totally enclosed, snap-cover type.

2.4 CABLE TRAYS

NEMA VE 1. Provide the following:

a. Cable trays: Form a wireway system, with a nominal 4 inch depth.

b. Cable trays: Constructed of galvanized steel.

c. Cable trays: Include splice and end plates, dropouts, and miscellaneous hardware.

d. Edges, fittings, and hardware: Finished free from burrs and sharp edges.

e. Fittings: Ensure not less than load-carrying ability of straight tray sections and have manufacturer's minimum standard radius.

f. Radius of bends: 12 inches.

2.4.1 Basket-Type Cable Trays

Provide size as indicated and 4 inch depth with maximum wire mesh spacing of 2 by 4 inch.

2.5 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.5.1 Floor Outlet Boxes

Provide the following:

a. Boxes: Adjustable and concrete tight.

b. Each outlet: Consisting of nonmetallic or cast-metal body with

threaded openings, or sheet-steel body with knockouts for conduits, and cover plate with 1 inch threaded plug.

d. Receptacle outlets: Consisting of flush aluminum or stainless steel housing with duplex-type receptacle as specified herein.

e. Provide gaskets where necessary to ensure watertight installation.

2.5.2 Outlet Boxes for Telecommunications System

Provide the following:

a. Standard type 4 inches square by 2-1/8 inches deep.

b. Depth of boxes: Large enough to allow manufacturers' recommended conductor bend radii.

2.6 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.7 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Do not use wires and cables manufactured more than 12 months prior to date of delivery to site.

2.7.1 Conductors

Provide the following:

a. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.

b. Conductors No. 8 AWG and larger diameter: Stranded.

c. Conductors No. 10 AWG and smaller diameter: Solid.

d. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3: Stranded unless specifically indicated otherwise.

e. All conductors: Copper.

2.7.1.1 Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

a. Branch circuits: No. 12 AWG.

b. Class 1 remote-control and signal circuits: No. 14 AWG.

c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.

d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.

2.7.2 Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

2.7.2.1 Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

a. Grounding conductors: Green.

b. Neutral conductors: White.

c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals color coding: White with a different colored (not green) stripe for each.

2.7.2.2 Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

a. 208/120 volt, three-phase.

1. Phase A - black.

2. Phase B - red.

3. Phase C - blue.

2.7.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, provide power and lighting wires rated for 600 volts, Type THWN/THHN conforming to UL 83 or Type XHHW conforming to UL 44, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits: Type TW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.7.4 Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.7.5 Metal-Clad Cable

UL 1569; NFPA 70, Type MC cable.

2.7.6 Cord Sets and Power-Supply Cords

UL 817.

2.8 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires: Insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on

splicing connector). Provide solderless terminal lugs on stranded conductors.

2.9 DEVICE PLATES

Provide the following:

a. UL listed, one-piece device plates for outlets to suit the devices installed.

b. For metal outlet boxes, plates on unfinished walls: Zinc-coated sheet steel or cast metal having round or beveled edges.

c. For nonmetallic boxes and fittings, other suitable plates may be provided.

d. Plates on finished walls: Satin finish stainless steel or brushed-finish aluminum, minimum 0.03 inch thick.

e. Screws: Machine-type with countersunk heads in color to match finish of plate.

f. Sectional type device plates are not be permitted.

g. Plates installed in wet locations: Gasketed and UL listed for "wet locations."

2.10 SWITCHES

2.10.1 Toggle Switches

NEMA WD 1, UL 20, single pole, three-way, and four-way, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. Include the following:

a. Handles: White thermoplastic.

b. Wiring terminals: Screw-type, side-wired.

c. Contacts: Silver-cadmium and contact arm - one-piece copper alloy.

d. Switches: Rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

e. Master Override: Provide 2-pole, single throw switch where indicated for guest suite master override. Master override switch shall be wired ahead of any local switching as indicated, and shall manual turn off any indicated lighting and/or switched receptacles circuits within the guest rooms.

2.10.2 Switch with Orange Pilot Handle

NEMA WD 1. Provide the following:

a. Pilot lights that are integrally constructed as a part of the switch's handle. Provide illuminated switch at entrance to each room and bathroom for control of lighting as indicated on plans.

b. Pilot light color: Orange, and illuminate whenever the switch is open

or "off."

c. Pilot lighted switch: Rated 20 amps and 120 volts or 277 volts as indicated.

d. The circuit's neutral conductor to each switch with a pilot light.

2.10.3 Breakers Used as Switches

For 120- and 277-volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

2.10.4 Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches. Utilize Class R fuseholders and fuses for fused switches, unless indicated otherwise. Provide horsepower rated for switches serving as the motor-disconnect means. Provide switches in NEMA 1, enclosure per NEMA ICS 6.

2.11 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch panel. Coordinate time-current characteristics curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices for proper operation. Submit coordination data for approval. Provide fuses with a voltage rating not less than circuit voltage.

2.11.1 Fuseholders

Provide in accordance with UL 4248-1.

2.11.2 Cartridge Fuses, Current Limiting Type (Class R)

UL 198M, Class RK-1. Provide only Class R associated fuseholders in accordance with UL 4248-12.

2.11.3 Cartridge Fuses, High-Interrupting Capacity, Current Limiting Type (Classes J, L, and CC)

UL 198M, Class J for 0 to 600 amperes, Class L for 601 to 6,000 amperes, and Class CC for 0 to 30 amperes.

2.11.4 Cartridge Fuses, Current Limiting Type (Class T)

UL 198M, Class T for 0 to 1,200 amperes, 300 volts; and 0 to 800 amperes, 600 volts.

2.12 RECEPTACLES

Provide the following:

a. UL 498, hard use (also designated heavy-duty) grounding-type.

b. Ratings and configurations: As indicated.

c. Bodies: White as per NEMA WD 1.

d. Face and body: Thermoplastic supported on a metal mounting strap.

e. Dimensional requirements: Per NEMA WD 6.

f. Screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.

g. Grounding pole connected to mounting strap.

h. The receptacle: Containing triple-wipe power contacts and double or triple-wipe ground contacts.

2.12.1 Switched Duplex Receptacles

Provide split-wired receptacles with separate terminals for each ungrounded pole. Top receptacle: Switched when installed. Provide label on each switched receptacle indicating which outlet is switched. Split-wired receptacles shall be wired to a master manual override switch as indicated on design drawings.

2.12.2 Weatherproof Receptacles

Provide receptacles, UL listed for use in "wet locations." Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, die-cast metal/aluminum cover plate.

2.12.3 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Provide device capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A ground-fault circuit interrupter devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.12.4 Special-Purpose Receptacles

Provide in ratings indicated. Furnish one matching plug with each receptacle.

2.12.5 Plugs

Provide heavy-duty, rubber-covered three-, four-, or five-wire cord of required size, install plugs thereon, and attach to equipment. Provide UL listed plugs with receptacles, complete with grounding blades. Where equipment is not available, turn over plugs and cord assemblies to the Government.

2.12.6 Dryer Receptacles

NEMA 14-30 configuration, rated 30 amperes, 125/250 volts.

2.12.7 Tamper-Resistant Receptacles

Provide duplex receptacle with mechanical sliding shutters that prevent the insertion of small objects into its contact slots. Tamper resistant receptacles shall be utilized within all guest rooms and suites.

2.13 PANELBOARDS

Provide panelboards in accordance with the following:

a. UL 67 and UL 50 having a short-circuit current rating as indicated.

b. Panelboards for use as service disconnecting means: Additionally conform to UL 869A.

c. Panelboards: Circuit breaker-equipped.

d. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.

e. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings.

f. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise.

g. Main breaker: "Separately" mounted "above" branch breakers.

h. Where "space only" is indicated, make provisions for future installation of breakers.

i. Directories: Indicate load served by each circuit in panelboard.

j. Directories: Indicate source of service to panelboard (e.g., Panel PA served from Panel MDP).

k. Type directories and mount in holder behind transparent protective covering.

l. Panelboard nameplates: Provided in accordance with paragraph FIELD FABRICATED NAMEPLATES.

2.13.1 Enclosure

Provide panelboard enclosure in accordance with the following:

a. UL 50.

b. Cabinets mounted outdoors or flush-mounted: Hot-dipped galvanized after fabrication.

c. Cabinets: Painted in accordance with paragraph PAINTING.

d. Outdoor cabinets: NEMA 3R raintight with a removable steel plate 1/4 inch thick in the bottom for field drilling for conduit connections.

e. Front edges of cabinets: Form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front.

f. All cabinets: Fabricated such that no part of any surface on the finished cabinet deviates from a true plane by more than 1/8 inch.

g. Holes: Provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a 1/2 inch clear space between the back of the cabinet and the wall surface.

h. Flush doors: Mounted on hinges that expose only the hinge roll to view when the door is closed.

i. Each door: Fitted with a combined catch and lock, except that doors over 24 inches long provided with a three-point latch having a knob with a T-handle, and a cylinder lock.

j. Keys: Two provided with each lock, with all locks keyed alike.

k. Finished-head cap screws: Provided for mounting the panelboard fronts on the cabinets.

2.13.2 Panelboard Buses

Support bus bars on bases independent of circuit breakers. Design main buses and back pans so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

2.13.2.1 Panelboard Neutrals for Non-Linear Loads

Provide in accordance with the following:

a. UL listed, with panelboard type specifically UL heat rise tested for use on non-linear loads.

b. Panelboard: Heat rise tested in accordance with UL 67, except with the neutral assembly installed and carrying 200 percent of the phase bus current during testing.

c. Verification of the testing procedure: Provided upon request.

d. Two neutral assemblies paralleled together with cable is not acceptable.

e. Nameplates for panelboard rated for use on non-linear loads: Marked "SUITABLE FOR NON-LINEAR LOADS" and in accordance with paragraph FIELD-FABRICATED NAMEPLATES.

f. Provide a neutral label with instructions for wiring the neutral of panelboards rated for use on non-linear loads.

2.13.3 Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals: UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.13.3.1 Multipole Breakers

Provide common trip-type with single operating handle. Design breaker such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.13.3.2 Circuit Breaker with Ground-Fault Circuit Interrupter

UL 943 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 943 for Class A ground-fault circuit interrupter.

2.13.3.3 Circuit Breakers for HVAC Equipment

Provide circuit breakers for HVAC equipment having motors (group or individual) marked for use with HACR type and UL listed as HACR type.

2.13.3.4 Arc-Fault Circuit Interrupters

UL 489, UL 1699 and NFPA 70. Molded case circuit breakers: Rated as indicated. Provide with "push-to-test" button.

2.14 ENCLOSED CIRCUIT BREAKERS

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated.

2.15 MOTOR SHORT-CIRCUIT PROTECTOR (MSCP)

Motor short-circuit protectors, also called motor circuit protectors (MCPs): UL 508 and UL 489, and provided as shown. Provide MSCPs that consist of an adjustable instantaneous trip circuit breaker used only in conjunction with a combination motor controller which provides coordinated motor branch-circuit overload and short-circuit protection. Rate MSCPs in accordance with the requirements of NFPA 70.

2.16 MOTORS

Provide motors in accordance with the following:

a. NEMA MG 1.

b. Hermetic-type sealed motor compressors: Also comply with UL 984.

c. Provide the size in terms of HP, or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified.

d. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters.

e. Rate motors for operation on 208-volt, 3-phase circuits with a terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits with a terminal voltage rating of 460 volts.

f. Use motors designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.

g. Unless otherwise indicated, use continuous duty type motors if rated 1 HP and above.

h. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.

2.16.1 High Efficiency Single-Phase Motors

Single-phase fractional-horsepower alternating-current motors: High efficiency types corresponding to the applications listed in NEMA MG 11. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

2.16.2 Premium Efficiency Polyphase Motors

Select polyphase motors based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10. In addition, continuous rated, polyphase squirrel-cage medium induction motors must meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

2.16.3 Motor Sizes

Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

2.16.4 Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment as specified herein. Power wiring and conduit: Conform to the requirements specified herein. Control wiring: Provided under, and conform to, the requirements of the section specifying the associated equipment.

2.17 MOTOR CONTROLLERS

Provide motor controllers in accordance with the following:

a. UL 508, NEMA ICS 1, and NEMA ICS 2.

b. Provide controllers with thermal overload protection in each phase, and one spare normally open auxiliary contact, and one spare normally closed auxiliary contact.

c. Provide controllers for motors rated 1-hp and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.

d. Provide protection for motors from immediate restart by a time adjustable restart relay.

e. When used with pressure, float, or similar automatic-type or maintained-contact switch, provide a hand/off/automatic selector switch with the controller.

f. Connections to selector switch: Wired such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position.

g. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices: Connected in motor control circuit in "hand" and "automatic" positions.

h. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device: Made in accordance with indicated or manufacturer's approved wiring diagram.

i. Provide a disconnecting means, capable of being locked in the open position, for the motor that is located in sight from the motor location and the driven machinery location. As an alternative, provide a motor controller disconnect, capable of being locked in the open position, to serve as the disconnecting means for the motor if it is in sight from the motor location and the driven machinery location.

j. Overload protective devices: Provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case.

k. Cover of combination motor controller and manual switch or circuit breaker: Interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position.

l. Minimum short circuit withstand rating of combination motor controller: 10,000 rms symmetrical amperes.

2.17.1 Control Wiring

Provide control wiring in accordance with the following:

a. All control wire: Stranded tinned copper switchboard wire with 600-volt flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and passing the VW-1 flame tests included in those standards.

b. Hinge wire: Class K stranding.

c. Current transformer secondary leads: Not smaller than No. 10 AWG.

d. Control wire minimum size: No. 14 AWG.

e. Power wiring for 480-volt circuits and below: The same type as control wiring with No. 12 AWG minimum size.

f. Provide wiring and terminal arrangement on the terminal blocks to permit the individual conductors of each external cable to be terminated on adjacent terminal points.

2.17.2 Control Circuit Terminal Blocks

Provide control circuit terminal blocks in accordance with the following:

a. NEMA ICS 4.

b. Control circuit terminal blocks for control wiring: Molded or fabricated type with barriers, rated not less than 600 volts.

c. Provide terminals with removable binding, fillister or washer head screw type, or of the stud type with contact and locking nuts.

d. Terminals: Not less than No. 10 in size with sufficient length and space for connecting at least two indented terminals for 10 AWG conductors to each terminal.

e. Terminal arrangement: Subject to the approval of the Contracting Officer with not less than four (4) spare terminals or 10 percent, whichever is greater, provided on each block or group of blocks.

f. Modular, pull apart, terminal blocks are acceptable provided they are of the channel or rail-mounted type.

g. Submit data showing that any proposed alternate will accommodate the specified number of wires, are of adequate current-carrying capacity, and are constructed to ensure positive contact between current-carrying parts.

2.17.2.1 Types of Terminal Blocks

a. Short-Circuiting Type: Short-circuiting type terminal blocks: Furnished for all current transformer secondary leads with provision for shorting together all leads from each current transformer without first opening any circuit. Terminal blocks: Comply with the requirements of paragraph CONTROL CIRCUIT TERMINAL BLOCKS above.

b. Load Type: Load terminal blocks rated not less than 600 volts and of adequate capacity: Provided for the conductors for NEMA Size 3 and smaller motor controllers and for other power circuits, except those for feeder tap units. Provide terminals of either the stud type with contact nuts and locking nuts or of the removable screw type, having length and space for at least two indented terminals of the size required on the conductors to be terminated. For conductors rated more than 50 amperes, provide screws with hexagonal heads. Conducting parts between connected terminals must have adequate contact surface and cross-section to operate without overheating. Provide each connected terminal with the circuit designation or wire number placed on or near the terminal in permanent contrasting color.

2.17.3 Control Circuits

Control circuits: Maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers: Conform to UL 506, as applicable. Transformers, other than transformers in bridge circuits: Provide primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. Provide fuses in each ungrounded primary feeder. Provide

one fused secondary lead with the other lead grounded.

2.17.4 Enclosures for Motor Controllers

NEMA ICS 6.

2.17.5 Multiple-Speed Motor Controllers and Reversible Motor Controllers

Across-the-line-type, electrically and mechanically interlocked. Multiple-speed controllers: Include compelling relays and multiple-button, station-type with pilot lights for each speed.

2.17.6 Pushbutton Stations

Provide with "start/stop" momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations: Heavy duty, oil-tight design.

2.17.7 Pilot and Indicating Lights

Provide LED cluster lamps.

2.17.8 Reduced-Voltage Controllers

Provide for polyphase motors 20 horsepower and larger. Reduced-voltage starters: Single-step, closed transition with an adjustable time interval between application of reduced and full voltages to motors.

2.18 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single or double pole designed for surface mounting with overload protection.

2.18.1 Pilot Lights

Provide yoke-mounted, seven element LED cluster light module. Color: red in accordance with NEMA ICS 2.

2.19 MOTOR CONTROL CENTERS

2.19.1 Combination Motor Controllers

UL 508 and other requirements in paragraph, MOTOR CONTROLLERS. Provide in controller a fusible switch with clips for fuses for branch circuit protection.

2.20 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Comply with requirements of Division 23, "Mechanical" for mechanical isolation of machines and other equipment.

2.21 TELECOMMUNICATIONS SYSTEM

Provide system of telecommunications wire-supporting structures (pathway), including: Outlet boxes, conduits with pull wires, wireways, cable trays, and other accessories for telecommunications outlets and pathway in accordance with TIA-569 and as specified herein. Additional

telecommunications requirements are specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.22 COMMUNITY ANTENNA TELEVISION (CATV) SYSTEM

2.22.1 CATV Outlets

Provide flush mounted, 75-ohm, F-type connector outlet rated from 5 to 1, 000 MHz in standard electrical outlet boxes with mounting frame.

2.22.2 CATV Faceplates

Provide modular faceplates for mounting of CATV Outlets. Faceplate color: Match outlet and switch coverplates.

2.22.3 Backboards

Coordinate CATV backboard requirements with telecommunications backboard requirements as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING.

2.23 GROUNDING AND BONDING EQUIPMENT

2.23.1 Ground Rods

UL 467. Ground rods: Copper-clad, with minimum diameter of 3/4 inch and minimum length 10 feet. Sectional ground rods are permitted.

2.23.2 Ground Bus

Copper ground bus: Provided in the electrical equipment rooms as indicated.

2.23.3 Telecommunications and CATV Grounding Busbar

Provide corrosion-resistant grounding busbar suitable for indoor installation in accordance with TIA-607. Busbars: Plated for reduced contact resistance. If not plated, clean the busbar prior to fastening the conductors to the busbar and apply an anti-oxidant to the contact area to control corrosion and reduce contact resistance. Provide a telecommunications main grounding busbar (TMGB) in the telecommunications entrance facility. The telecommunications main grounding busbar (TMGB): Sized in accordance with the immediate application requirements and with consideration of future growth. Provide telecommunications grounding busbars with the following:

a. Predrilled copper busbar provided with holes for use with standard sized lugs.

b. Minimum dimensions of 0.25 inch thick by 4 inches wide for the TMGB with length as indicated.

c. Listed by a nationally recognized testing laboratory.

2.24 MANUFACTURER'S NAMEPLATE

Provide on each item of equipment a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be

acceptable.

2.25 FIELD-FABRICATED NAMEPLATES

Provide field-fabricated nameplates in accordance with the following:

a. ASTM D709.

b. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.

c. Each nameplate inscription: Identify the function and, when applicable, the position.

d. Nameplates: Melamine plastic, 0.125 inch thick, white with black center core.

e. Surface: Matte finish. Corners: Square. Accurately align lettering and engrave into the core.

f. Minimum size of nameplates: 1 by 2.5 inches.

g. Lettering size and style: A minimum of 0.25 inch high normal block style.

2.26 WARNING SIGNS

Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. Provide marking that is clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.27 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00 FIRESTOPPING.

2.28 WIREWAYS

UL 870. Material: Steel epoxy painted or galvanized 16 gauge for heights and depths up to 6 by 6 inches, and 14 gauge for heights and depths up to 12 by 12 inches. Provide in length required for the application with hinged-cover NEMA 1 enclosure per NEMA ICS 6.

2.29 SURGE PROTECTIVE DEVICES

Provide parallel type surge protective devices (SPD) which comply with UL 1449 at the service entrance and panelboards. Provide surge protectors in a NEMA 1 enclosure per NEMA ICS 6. Use Type 1 or Type 2 SPD and connect on the load side of a dedicated circuit breaker.

Provide the following modes of protection:

FOR SINGLE PHASE AND THREE PHASE WYE CONNECTED SYSTEMS:
Phase to phase (L-L).
Each phase to neutral (L-N).
Phase to ground (L-G).

SPDs at the service entrance: Provide with a minimum surge current rating of 100,000 amperes for L-L mode minimum and 50,000 amperes for other modes (L-N, L-G, and N-G).

Provide SPDs. Maximum L-N, L-G, and N-G Voltage Protection Rating:

700 volts for 208Y/120 volt, three phase system

Maximum L-L Voltage Protection Rating:

1,200 volt for 208Y/120 volt, three phase system.

The minimum MCOV (Maximum Continuous Operating Voltage) rating for L-N and L-G modes of operation: 120 percent of nominal voltage for 240 volts and below; 115 percent of nominal voltage above 240 volts to 480 volts.

2.30 FACTORY-APPLIED FINISH

Provide factory-applied finish on electrical equipment in accordance with the following:

a. NEMA 250 corrosion-resistance test and the additional requirements as specified herein.

b. Interior and exterior steel surfaces of equipment enclosures: Thoroughly cleaned followed by a rust-inhibitive phosphatizing or equivalent treatment prior to painting.

c. Exterior surfaces: Free from holes, seams, dents, weld marks, loose scale or other imperfections.

d. Interior surfaces: Receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice.

e. Exterior surfaces: Primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish.

f. Equipment located indoors: ANSI Light Gray.

g. Provide manufacturer's coatings for touch-up work and as specified in paragraph FIELD-APPLIED PAINTING.

2.31 SOURCE QUALITY CONTROL

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces: Conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

3.1.1 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures: Labeled and identified as such.

3.1.1.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, label each enclosure, new and existing, as one of several enclosures containing service entrance disconnect devices. Label, at minimum: Indicate number of service disconnect devices housed by enclosure and indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph FIELD-FABRICATED NAMEPLATES. Use lettering of at least 0.25 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure: Provided only as permitted by NFPA 70.

3.1.2 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor: Separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size: 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings: Made with metal conduit in fire-rated shafts, with metal conduit extending through shafts for minimum distance of 6 inches. Firestop conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors in accordance with Section 07 84 00 FIRESTOPPING.

3.1.2.1 Pull Wire

Install pull wires in empty conduits. Pull wire: Plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.2.2 Metal-Clad Cable

Install in accordance with NFPA 70, Type MC cable. MC cabling shall be permitted for use within the confines of the individual suite units when concealed within walls and above ceiling to feed general receptacle and lighting loads. Use only concealed in existing areas where walls and ceilings are not disturbed, and for guest room branch circuits. Homeruns of MC cable branch circuits shall be individually insulated copper conductors in EMT conduit. Do not use MC cabling for homeruns, feeders, or in hallways.

3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.3.1 Restrictions Applicable to Aluminum Conduit

a. Do not install underground or encase in concrete or masonry.

b. Do not use brass or bronze fittings.

3.1.3.2 Restrictions Applicable to EMT

a. Do not install underground.

b. Do not encase in concrete, mortar, grout, or other cementitious materials.

c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.

d. Do not use outdoors.

3.1.3.3 Restrictions Applicable to Nonmetallic Conduit

a. PVC Schedule 40 and PVC Schedule 80.

1. Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms and other such areas.

2. Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

3. Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

3.1.3.4 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS.

3.1.3.5 Underground Conduit

Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40 or 80. Convert nonmetallic conduit to plastic-coated rigid, or IMC, steel conduit before rising through floor slab. Plastic coating: Extend minimum 6 inches above floor.

3.1.3.6 Conduit through Floor Slabs

Where conduits rise through floor slabs, do not allow curved portion of bends to be visible above finished slab.

3.1.3.7 Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Do not exceed one-fourth proof test load for load applied to fasteners. Provide vibration-resistant and shock-resistant fasteners

attached to concrete ceiling. Do not cut main reinforcing bars for any holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems: Supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installation with above-ceiling mechanical systems to ensure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Support exposed risers in wire shafts of multistory buildings by U-clamp hangers at each floor level and at 10 foot maximum intervals. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2-1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.3.8 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.3.9 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Provide locknuts with sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.3.10 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size: 1/2 inch diameter. Provide liquidtight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.3.11 Telecommunications and Signal System Pathway

Install telecommunications pathway in accordance with TIA-569.

a. Horizontal Pathway: Telecommunications pathways from the work area to the telecommunications room: Installed and cabling length requirements in accordance with TIA-568-C.1. Size conduits, wireways, and cable trays in accordance with TIA-569 and as indicated.

b. Backbone Pathway: Telecommunication pathways from the

telecommunications entrance facility to telecommunications rooms, and, telecommunications equipment rooms (backbone cabling): Installed in accordance with TIA-569. Size conduits, wireways, and cable trays for telecommunications risers in accordance with TIA-569.

3.1.3.12 Community Antenna Television (CATV) System Conduits

Install a system of CATV wire-supporting structures (pathway), including: Outlet boxes, conduits with pull wires, wireways, cable trays, and other accessories for CATV outlets and pathway in accordance with TIA-569. Provide distribution system with star topology with empty conduit and pullwire from each outlet box to the telecommunications room and empty conduit and pullwire from each telecommunications room to the headend equipment location.

3.1.4 Cable Tray Installation

Install cable trays parallel with or at right angles to ceilings, walls, and structural members. Support at maximum 6 foot intervals. In addition, install and ground telecommunications cable tray in accordance with TIA-569, and TIA-607. Ensure edges, fittings, and hardware are finished free from burrs and sharp edges. Provide No. 2 AWG bare copper wire throughout cable tray system, and bond to each section. Use No. 1/0 aluminum wire if cable tray is aluminum. Install conductors that run though smoke and fire partitions in 4 inch rigid steel conduits with grounding bushing, extending 12 inches beyond each side of partitions. Seal conduit on both ends to maintain smoke and fire ratings of partitions. Provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.5 Telecommunications Cable Support Installation

Install open top and closed ring cable supports on 4 foot to 5 foot centers to adequately support and distribute the cable’s weight. Use these types of supports to support a maximum of 50 0.25 inch diameter cables. Install suspended cables with at least 3 inches of clear vertical space above the ceiling tiles and support channels (T-bars). Open top and closed ring cable supports: Suspended from or attached to the structural ceiling or walls with hardware or other installation aids specifically designed to support their weight.

3.1.6 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways: Cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated. Boxes in other locations: Sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. Provide each box with volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures: Minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls: Square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with

outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; provide readily removable fixtures for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.6.1 Boxes

Boxes for use with raceway systems: Minimum 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: Minimum 4 inches square, except that 4 by 2 inch boxes may be used where only one raceway enters outlet. Telecommunications outlets: A minimum of 4 inches square by 2-1/8 inches deep. Mount outlet boxes flush in finished walls.

3.1.6.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.6.3 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

3.1.7 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor. Mount receptacles and telecommunications outlets 18 inches above finished floor, unless otherwise indicated. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.1.8 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, provide color coding by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, provide color coding by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with Section 23 09 53.00 20 SPACE TEMPERATURE CONTROL SYSTEMS. Provide telecommunications system conductor

identification as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEMS.

3.1.8.1 Marking Strips

Provide marking strips in accordance with the following:

a. Provide white or other light-colored plastic marking strips, fastened by screws to each terminal block, for wire designations.

b. Use permanent ink for the wire numbers.

c. Provide reversible marking strips to permit marking both sides, or provide two marking strips with each block.

d. Size marking strips to accommodate the two sets of wire numbers.

e. Assign a device designation in accordance with NEMA ICS 1 to each device to which a connection is made. Mark each device terminal to which a connection is made with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams.

f. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, provide additional wire and cable designations for identification of remote (external) circuits for the Government's wire designations.

g. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.

3.1.9 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.10 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.11 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00 FIRESTOPPING.

3.1.12 Grounding and Bonding

Provide in accordance with NFPA 70 and NFPA 780. Ground exposed,

non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems.

Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70.

Make ground connection to driven ground rods on exterior of building. Interconnect all grounding media in or on the structure to provide a common ground potential. This includes lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Make interconnection to the gas line on the customer's side of the meter. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system.

In addition to the requirements specified herein, provide telecommunications grounding in accordance with TIA-607. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.12.1 Ground Rods

Provide cone pointed ground rods. Measure the resistance to ground using the fall-of-potential method described in IEEE 81. Do not exceed 25 ohms under normally dry conditions for the maximum resistance of a driven ground. If this resistance cannot be obtained with a single rod, 3 additional rods, spaced on center, not less than twice the distance of the length of the rod. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Contracting Officer who will decide on the number of ground rods to add.

3.1.12.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Provide tools and dies as recommended by the manufacturer. Use an embossing die code or other standard method to provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.12.3 Ground Bus

Provide a copper ground bus in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of transformer neutrals and other electrical equipment: Effectively grounded by bonding to the ground bus. Bond the ground bus to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Make connections and splices of the brazed, welded, bolted, or pressure-connector type, except use pressure connectors or bolted connections for connections to removable equipment.

3.1.12.4 Resistance

Maximum resistance-to-ground of grounding system: Do not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.12.5 Telecommunications System

Provide telecommunications grounding in accordance with the following:

a. Telecommunications Grounding Busbars: Provide a telecommunications main grounding busbar (TMGB) in the telecommunications entrance facility. Install the TMGB as close to the electrical service entrance grounding connection as practicable. Install telecommunications grounding busbars to maintain clearances as required by NFPA 70 and insulated from its support. A minimum of 2 inches separation from the wall is recommended to allow access to the rear of the busbar and adjust the mounting height to accommodate overhead or underfloor cable routing.

b. Telecommunications Bonding Conductors: Provide main telecommunications service equipment ground consisting of separate bonding conductor for telecommunications, between the TMGB and readily accessible grounding connection of the electrical service. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in ferrous metallic conduit that exceeds 3 feet in length, bond the conductors to each end of the conduit using a grounding bushing or a No. 6 AWG conductor.

c. Telecommunications Grounding Connections: Telecommunications grounding connections to the TMGB: Utilize listed compression two-hole lugs, exothermic welding, suitable and equivalent one hole non-twisting lugs, or other irreversible compression type connections. Bond all metallic pathways, cabinets, and racks for telecommunications cabling and interconnecting hardware located within the same room or space as the TMGB to the TMGB. In a metal frame (structural steel) building, where the steel framework is readily accessible within the room; bond each TMGB to the vertical steel metal frame using a minimum No. 6 AWG conductor. Where the metal frame is external to the room and readily accessible, bond the metal frame to the TGB or TMGB with a minimum No. 6 AWG conductor. When practicable because of shorter distances and, where horizontal steel members are permanently electrically bonded to vertical column members, the TGB may be bonded to these horizontal members in lieu of the vertical column members. All connectors used for bonding to the metal frame of a building must be listed for the intended purpose.

3.1.13 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications and are provided under the section specifying the associated equipment.

3.1.14 Elevator

Provide circuit to line terminals of elevator controller, and disconnect switch on line side of controller, outlet for control power, outlet receptacle and work light at midheight of elevator shaft, and work light and outlet receptacle in elevator pit.

3.1.15 Government-Furnished Equipment

Contractor makes connections to Government-furnished equipment to make equipment operate as intended, including providing miscellaneous items such as plugs, receptacles, wire, cable, conduit, flexible conduit, and outlet boxes or fittings.

3.1.16 Repair of Existing Work

Perform repair of existing work, demolition, and modification of existing electrical distribution systems as indicated:

3.1.16.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

3.1.16.2 Existing Concealed Wiring to be Removed

Disconnect existing concealed wiring to be removed from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3.1.16.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment includes equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.

3.1.17 Surge Protective Devices

Connect the surge protective devices in parallel to the power source, keeping the conductors as short and straight as practically possible. Maximum allowed lead length is 3 feet.

3.2 FIELD-FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.4 FIELD-APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting: As specified in Section 09 90 00 PAINTS AND COATINGS. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 10 working days notice prior to each test.

3.5.1 Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

3.5.2 600-Volt Wiring Test

Test wiring rated 600 volts and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance: 250,000 ohms.

3.5.3 Transformer Tests

Perform the standard, not optional, tests in accordance with the Inspection and Test Procedures for transformers, dry type, air-cooled, 600 volt and below; as specified in NETA ATS. Measure primary and secondary voltages for proper tap settings. Tests need not be performed by a recognized independent testing firm or independent electrical consulting firm.

3.5.4 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug-in light) to verify that the "line" and "load" leads are not reversed.

3.5.5 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 26 29 23

VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 519	(2014) Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2014) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 3.1	(2009) Guide for the Application, Handling, Storage, Installation and Maintenance of Medium-Voltage AC Contactors, Controllers and Control Centers
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA ICS 7	(2014) Adjustable-Speed Drives

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-461	(2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 489	(2013; Reprint Mar 2014) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 508C	(2002; Reprint Nov 2010) Power Conversion Equipment

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS, and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM apply to this section with additions and modifications specified herein.

1.3 SYSTEM DESCRIPTION

1.3.1 Performance Requirements

1.3.1.1 Electromagnetic Interference Suppression

Computing devices, as defined by 47 CFR 15, MIL-STD-461 rules and regulations, shall be certified to comply with the requirements for class A computing devices and labeled as set forth in part 15.

1.3.1.2 Electromechanical and Electrical Components

Electrical and electromechanical components of the Variable Frequency Drive (VFD) shall not cause electromagnetic interference to adjacent electrical or electromechanical equipment while in operation.

1.3.2 Electrical Requirements

1.3.2.1 Power Line Surge Protection

IEEE C62.41.1 and IEEE C62.41.2, IEEE 519 Control panel shall have surge protection, included within the panel to protect the unit from damaging transient voltage surges. Surge arrestor shall be mounted near the incoming power source and properly wired to all three phases and ground. Fuses shall not be used for surge protection.

1.3.2.2 Sensor and Control Wiring Surge Protection

I/O functions as specified shall be protected against surges induced on control and sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Schematic diagrams; G

Interconnecting diagrams; G

Installation drawings; G

Submit drawings for government approval prior to equipment construction or integration. Modifications to original drawings made during installation shall be immediately recorded for inclusion into the as-built drawings.

SD-03 Product Data

Variable frequency drives; G

Wires and cables

Equipment schedule

Include data indicating compatibility with motors being driven.

SD-06 Test Reports

VFD Test

Performance Verification Tests

Endurance Test

SD-08 Manufacturer's Instructions

Installation instructions

SD-09 Manufacturer's Field Reports

VFD Factory Test Plan; G

Factory test results

SD-10 Operation and Maintenance Data

Variable frequency drives, Data Package 4

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Provide service and maintenance information including preventive maintenance, assembly, and disassembly procedures. Include electrical drawings from electrical general sections. Submit additional information necessary to provide complete operation, repair, and maintenance information, detailed to the smallest replaceable unit. Include copies of as-built

submittals. Provide routine preventative maintenance instructions, and equipment required. Provide instructions on how to modify program settings, and modify the control program. Provide instructions on drive adjustment, trouble-shooting, and configuration. Provide instructions on process tuning and system calibration.

1.5 QUALITY ASSURANCE

1.5.1 Schematic Diagrams

Show circuits and device elements for each replaceable module. Schematic diagrams of printed circuit boards are permitted to group functional assemblies as devices, provided that sufficient information is provided for government maintenance personnel to verify proper operation of the functional assemblies.

1.5.2 Interconnecting Diagrams

Show interconnections between equipment assemblies, and external interfaces, including power and signal conductors. Include for enclosures and external devices.

1.5.3 Installation Drawings

Show floor plan of each site, with V.F.D.'s and motors indicated. Indicate ventilation requirements, adequate clearances, and cable routes.

1.5.4 Equipment Schedule

Provide schedule of equipment supplied. Schedule shall provide a cross reference between manufacturer data and identifiers indicated in shop drawings. Schedule shall include the total quantity of each item of equipment supplied. For complete assemblies, such as VFD's, provide the serial numbers of each assembly, and a sub-schedule of components within the assembly. Provide recommended spare parts listing for each assembly or component.

1.5.5 Installation instructions

Provide installation instructions issued by the manufacturer of the equipment, including notes and recommendations, prior to shipment to the site. Provide operation instructions prior to acceptance testing.

1.5.6 Factory Test Results

Document test results and submit to government within 7 working days after completion of test.

1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.7 WARRANTY

The complete system shall be warranted by the manufacturer for a period of one year, or the contracted period of any extended warrantee agreed upon

by the contractor and the Government, after successful completion of the acceptance test. Any component failing to perform its function as specified and documented shall be repaired or replaced by the contractor at no additional cost to the Government. Items repaired or replaced shall be warranted for an additional period of at least one year from the date that it becomes functional again, as specified in the FAR CLAUSE 52.246-21.

1.8 MAINTENANCE

1.8.1 Spare Parts

Manufacturers provide spare parts in accordance with recommended spare parts list.

1.8.2 Maintenance Support

During the warranty period, the Contractor shall provide on-site, on-call maintenance services by Contractor's personnel on the following basis: The service shall be on a per-call basis with 36 hour response. Contractor shall support the maintenance of all hardware and software of the system. Various personnel of different expertise shall be sent on-site depending on the nature of the maintenance service required. Costs shall include travel, local transportation, living expenses, and labor rates of the service personnel while responding to the service request. The provisions of this Section are not in lieu of, nor relieve the Contractor of, warranty responsibilities covered in this specification. Should the result of the service request be the uncovering of a system defect covered under the warranty provisions, all costs for the call, including the labor necessary to identify the defect, shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES (VFD)

Provide frequency drive to control the speed of induction motor(s). The VFD shall include the following minimum functions, features and ratings.

a. Input circuit breaker per UL 489 with a minimum of 10,000 amps symmetrical interrupting capacity and door interlocked external operator.

b. A converter stage per UL 508C shall change fixed voltage, fixed frequency, ac line power to a fixed dc voltage. The converter shall utilize a full wave bridge design incorporating diode rectifiers. Silicon Controlled Rectifiers (SCR) are not acceptable. The converter shall be insensitive to three phase rotation of the ac line and shall not cause displacement power factor of less than .95 lagging under any speed and load condition.

c. An inverter stage shall change fixed dc voltage to variable frequency, variable voltage, ac for application to a standard NEMA design B squirrel cage motor. The inverter shall be switched in a manner to produce a sine coded pulse width modulated (PWM) output waveform.

d. The VFD shall be capable of supplying 120 percent of rated full load current for one minute at maximum ambient temperature.

e. The VFD shall be designed to operate from a 208 volt, plus or minus 10

percent, three phase, 60 Hz supply, and control motors with a corresponding voltage rating.

f. Acceleration and deceleration time shall be independently adjustable from one second to 60 seconds.

g. Adjustable full-time current limiting shall limit the current to a preset value which shall not exceed 120 percent of the controller rated current. The current limiting action shall maintain the V/Hz ratio constant so that variable torque can be maintained. Short time starting override shall allow starting current to reach 175 percent of controller rated current to maximum starting torque.

h. The controllers shall be capable of producing an output frequency over the range of 3 Hz to 60 Hz (20 to one speed range), without low speed cogging. Over frequency protection shall be included such that a failure in the controller electronic circuitry shall not cause frequency to exceed 110 percent of the maximum controller output frequency selected.

i. Minimum and maximum output frequency shall be adjustable over the following ranges: 1) Minimum frequency 3 Hz to 50 percent of maximum selected frequency; 2) Maximum frequency 40 Hz to 60 Hz.

j. The controller efficiency at any speed shall not be less than 96 percent.

k. The controllers shall be capable of being restarted into a motor coasting in the forward direction without tripping.

l. Protection of power semiconductor components shall be accomplished without the use of fast acting semiconductor output fuses. Subjecting the controllers to any of the following conditions shall not result in component failure or the need for fuse replacement:

1. Short circuit at controller output

2. Ground fault at controller output

3. Open circuit at controller output

4. Input undervoltage

5. Input overvoltage

6. Loss of input phase

7. AC line switching transients

8. Instantaneous overload

9. Sustained overload exceeding 115 percent of controller rated current

10. Over temperature

11. Phase reversal

m. Solid state motor overload protection shall be included such that

current exceeding an adjustable threshold shall activate a 60 second timing circuit. Should current remain above the threshold continuously for the timing period, the controller will automatically shut down.

n. A slip compensation circuit shall be included which will sense changing motor load conditions and adjust output frequency to provide speed regulation of NEMA B motors to within plus or minus 0.5 percent of maximum speed without the necessity of a tachometer generator.

o. The VFD shall be factory set for manual restart after the first protective circuit trip for malfunction (overcurrent,undervoltage, overvoltage or overtemperature) or an interruption of power. The VFD shall be capable of being set for automatic restart after a selected time delay. If the drive faults again within a specified time period (adjustable 0-60 seconds), a manual restart will be required.

p. The VFD shall include external fault reset capability. All the necessary logic to accept an external fault reset contact shall be included.

q. Provide critical speed lockout circuitry to prevent operating at frequencies with critical harmonics that cause resonant vibrations. The VFD shall have a minimum of three user selectable bandwidths.

r. Provide the following operator control and monitoring devices mounted on the front panel of the VFD:

1. Manual speed potentiometer.

2. Hand-Off-Auto (HOA) switch.

3. Power on light.

4. Drive run power light.

5. Local display.

s. Provide properly sized NEMA rated by-pass and isolation contactors to enable operation of motor in the event of VFD failure. Mechanical and electrical interlocks shall be installed between the by-pass and isolation contactors. Provide a selector switch and transfer delay timer.

2.2 ENCLOSURES

Provide equipment enclosures conforming to NEMA 250, NEMA ICS 7, NEMA ICS 6.

2.3 WIRES AND CABLES

All wires and cables shall conform to NEMA 250, NEMA ICS 7, NFPA 70.

2.4 NAMEPLATES

Nameplates external to NEMA enclosures shall conform with the requirements of Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS. Nameplates internal to enclosures shall be manufacturer's standard, with the exception that they must be permanent.

2.5 SOURCE QUALITY CONTROL

2.5.1 VFD Factory Test Plan

To ensure quality, each VFD shall be subject to a series of in-plant quality control inspections before approval for shipment from the manufacturer's facilities. Provide test plans and test reports.

PART 3 EXECUTION

3.1 INSTALLATION

Per NEMA ICS 3.1, install equipment in accordance with the approved manufacturer's printed installation drawings, instructions, wiring diagrams, and as indicated on project drawings and the approved shop drawings. A field representative of the drive manufacturer shall supervise the installation of all equipment, and wiring.

3.2 FIELD QUALITY CONTROL

Specified products shall be tested as a system for conformance to specification requirements prior to scheduling the acceptance tests. Contractor shall conduct performance verification tests in the presence of Government representative, observing and documenting complete compliance of the system to the specifications. Contractor shall submit a signed copy of the test results, certifying proper system operation before scheduling tests.

3.2.1 VFD Test

A proposed test plan shall be submitted to the contracting officer at least 28 calendar days prior to proposed testing for approval. The tests shall conform to NEMA ICS 1, NEMA ICS 7, and all manufacturer's safety regulations. The Government reserves the right to witness all tests and review any documentation. The contractor shall inform the Government at least 14 working days prior to the dates of testing. Contractor shall provide video tapes, if available, of all training provided to the Government for subsequent use in training new personnel. All training aids, texts, and expendable support material for a self-sufficient presentation shall be provided, the amount of which to be determined by the contracting officer.

3.2.2 Performance Verification Tests

"Performance Verification Test" plan shall provide the step by step procedure required to establish formal verification of the performance of the VFD. Compliance with the specification requirements shall be verified by inspections, review of critical data, demonstrations, and tests. The Government reserves the right to witness all tests, review data, and request other such additional inspections and repeat tests as necessary to ensure that the system and provided services conform to the stated requirements. The contractor shall inform the Government 14 calendar days prior to the date the test is to be conducted.

3.2.3 Endurance Test

Immediately upon completion of the performance verification test, the endurance test shall commence. The system shall be operated at varying rates for not less than 192 consecutive hours, at an average effectiveness

level of .9998, to demonstrate proper functioning of the complete PCS. Continue the test on a day-to-day basis until performance standard is met. During the endurance test, the contractor shall not be allowed in the building. The system shall respond as designed.

3.3 DEMONSTRATION

3.3.1 Training

Coordinate training requirements with the Contracting Officer.

3.3.1.1 Instructions to Government Personnel

Provide the services of competent instructors who will give full instruction to designated personnel in operation, maintenance, calibration, configuration, and programming of the complete control system. Orient the training specifically to the system installed. Instructors shall be thoroughly familiar with the subject matter they are to teach. The Government personnel designated to attend the training will have a high school education or equivalent. The number of training days of instruction furnished shall be as specified. A training day is defined as eight hours of instruction, including two 15-minute breaks and excluding lunch time; Monday through Friday. Provide a training manual for each student at each training phase which describes in detail the material included in each training program. Provide one additional copy for archiving. Provide equipment and materials required for classroom training. Provide a list of additional related courses, and offers, noting any courses recommended. List each training course individually by name, including duration, approximate cost per person, and location of course. Unused copies of training manuals shall be turned over to the Government at the end of last training session.

3.3.1.2 Operating Personnel Training Program

Provide one 2 hour training session at the site at a time and place mutually agreeable between the Contractor and the Government. Provide session to train 4 operation personnel in the functional operations of the system and the procedures that personnel will follow in system operation. This training shall include:

a. System overview

b. General theory of operation

c. System operation

d. Alarm formats

e. Failure recovery procedures

f. Troubleshooting

3.3.1.3 Engineering/Maintenance Personnel Training

Accomplish the training program as specified. Training shall be conducted on site at a location designated by the Government. Provide a one day training session to train 4 engineering personnel in the functional operations of the system. This training shall include:

a. System overview

b. General theory of operation

c. System operation

d. System configuration

e. Alarm formats

f. Failure recovery procedures

g. Troubleshooting and repair

h. Maintenance and calibration

i. System programming and configuration

-- End of Section --

SECTION 26 41 00

LIGHTNING PROTECTION SYSTEM
11/13

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 780	(2014) Standard for the Installation of Lightning Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL 467	(2007) Grounding and Bonding Equipment
UL 96	(2005; Reprint Sep 2013) Standard for Lightning Protection Components
UL Electrical Constructn	(2012) Electrical Construction Equipment Directory

1.2 RELATED REQUIREMENTS

1.2.1 Verification of Dimensions

Confirm all details of work, verify all dimensions in field, and advise Contracting Officer of any discrepancy before performing work. Obtain prior approval of Contracting Officer before making any departures from the design.

1.2.2 System Requirements

Provide a system furnished under this specification consisting of the latest UL Listed products of a manufacturer regularly engaged in production of lightning protection system components. Comply with NFPA 70, NFPA 780, and UL 96.

1.2.3 Lightning Protection System Installers Documentation

Provide documentation showing that the installer is certified with a

commercial third-party inspection company whose sole work is lightning protection, or is a UL Listed Lightning Protection Installer. In either case, the documentation must show that they have completed and passed the requirements for certification or listing, and have a minimum of 2 years documented experience installing lightning protection systems for DoD projects of similar scope and complexity.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overall lightning protection system; G

Each major component; G

SD-06 Test Reports

Lightning Protection and Grounding System Test Plan; G

Lightning Protection and Grounding System Test; G

SD-07 Certificates

Lightning Protection System Installers Documentation; G

Component UL Listed and Labeled; G

Lightning protection system inspection certificate; G

Roof manufacturer's warranty; G

1.4 QUALITY ASSURANCE

In each standard referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" or "must" has been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or words of similar meaning, to mean Contracting Officer.

1.4.1 Installation Drawings

1.4.1.1 Overall System Drawing

Submit installation shop drawing for the overall lightning protection system. Include on the drawings the physical layout of the equipment (plan view and elevations), mounting details, relationship to other parts of the work, and wiring diagrams.

1.4.1.2 Major Components

Submit detail drawings for each major component including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions.

1.4.2 Component UL Listed and Labeled

Submit proof of compliance that components are UL Listed and Labeled. Listing alone in UL Electrical Constructn, which is the UL Electrical Construction Directory, is not acceptable evidence. In lieu of Listed and Labeled, submit written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that items have been tested and conform to requirements and testing methods of Underwriters Laboratories.

1.4.3 Lightning Protection and Grounding System Test Plan

Provide a lightning protection and grounding system test plan. Detail both the visual inspection and electrical testing of the system and components in the test plan. Identify (number) the system test points/locations along with a listing or description of the item to be tested and the type of test to be conducted. As a minimum, include a sketch of the facility and surrounding lightning protection system as part of the specific test plan for each structure. Include the requirements specified in paragraph, "Testing of Integral Lightning Protection System" in the test plan.

1.4.4 Lightning Protection System Inspection Certificate

Provide certification from a commercial third-party inspection company whose sole work is lightning protection, stating that the lightning protection system complies with NFPA 780. Third party inspection company cannot be the system installer or the system designer. Alternatively, provide a UL Lightning Protection Inspection Master Label Certificate for each facility indicating compliance to NFPA 780.

Inspection must cover every connection, air terminal, conductor, fastener, accessible grounding point and other components of the lightning protection system to ensure 100% system compliance. This includes witnessing the tests for the resistance measurements for ground rods with test wells, and for continuity measurements for bonds. It also includes verification of proper surge protective devices for power, data and telecommunication systems. Random sampling or partial inspection of a facility is not acceptable.

1.5 SITE CONDITIONS

Confirm all details of work, verify all dimensions in field, and advise Contracting Officer of any discrepancy before performing work. Obtain prior approval of Contracting Officer before changing the design.

PART 2 PRODUCTS

2.1 MATERIALS

Do not use a combination of materials that forms an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, provide conductors with protective coatings, such as tin or lead, or oversize conductors. Where a mechanical hazard is involved, increase conductor size to compensate for the hazard or protect conductors. When metallic conduit or tubing is provided, electrically bond conductor to conduit or tubing at the upper and lower ends by clamp type connectors or

welds (including exothermic). All lightning protection components, such as bonding plates, air terminals, air terminal supports and braces, chimney bands, clips, connector fittings, and fasteners are to comply with the requirements of UL 96 classes as applicable.

2.1.1 Main and Bonding Conductors

NFPA 780 and UL 96 Class I, Class II, or Class II modified materials as applicable.

2.1.2 Copper Only

Provide copper conductors, except where aluminum conductors are required for connection to aluminum equipment.

2.2 COMPONENTS

2.2.1 Air Terminals

Provide solid air terminals with a blunt tip. Tubular air terminals are not permitted. Support air terminals more than 24 inches in length by suitable brace, supported at not less than one-half the height of the terminal.

2.2.2 Ground Rods

Provide ground rods made of solid copper conforming to conform to UL 467. Provide ground rods that are not less than 3/4 inch in diameter and 10 feet in length. Do not mix ground rods of copper-clad steel or solid copper on the job.

2.2.3 Connections and Terminations

Provide connectors for splicing conductors that conform to UL 96, class as applicable. Conductor connections can be made by clamps or welds (including exothermic). Provide style and size connectors required for the installation.

2.2.4 Connector Fittings

Provide connector fittings for "end-to-end," "Tee," or "Y" splices that conform to NFPA 780 and UL 96.

PART 3 EXECUTION

3.1 INTEGRAL SYSTEM

Provide a lightning protection system that meets the requirements of NFPA 780. Lightning protection system consists of air terminals, roof conductors, down conductors, ground connections, and grounding electrodes. Expose conductors on the structures except where conductors are required to be in protective sleeves. Bond secondary conductors with grounded metallic parts within the building. Make interconnections within side-flash distances at or below the level of the grounded metallic parts.

3.1.1 Roof-Mounted Components

Coordinate with the roofing manufacturer and provide certification that the roof manufacturer's warranty is not violated by the installation

methods for air terminals and roof conductors.

3.1.1.1 Air Terminals

Use adhesive shoes with adhesive approved by the roof manufacturer when installing air terminals on "rubber" (EPDM) type roofs. In areas of snow or constant wind, ensure that a section of roofing material (minimum dimensional area of 1 square foot) is first glued to the roof and then the air terminal is glued to it unless the roof manufacturer recommends another solution.

3.1.1.2 Roof Conductors

Use adhesive shoes with adhesive approved by the roof manufacturer when installing roof conductors on "rubber" (EPDM) type roofs.

3.1.2 Down Conductors

Protect exposed down conductors from physical damage as required by NFPA 780. Use Schedule 80 PVC to protect down conductors. Paint the Schedule 80 PVC to match the surrounding surface with paint that is approved for use on PVC.

3.1.3 Ground Connections

Attach each down conductor to ground rods by welding (including exothermic), brazing, or compression. All connections to ground rods below ground level must be by exothermic weld connection or with a high compression connection using a hydraulic or electric compression tool to provide the correct circumferential pressure. Accessible connections above ground level and in test wells can be accomplished by mechanical clamping.

3.1.4 Grounding Electrodes

Extend driven ground rods vertically into the existing undisturbed earth for a distance of not less 10 feet. Set ground rods not less than 3 feet nor more than 8 feet, from the structure foundation, and at least beyond the drip line for the facility. After the completed installation, measure the total resistance to ground using the fall-of-potential method described in IEEE 81. Maximum allowed resistance of a driven ground rod is 25 ohms, under normally dry conditions. Contact the Contracting Officer for direction on how to proceed when two of any three ground rods, driven not less than 10 feet into the ground, a minimum of 10 feet apart, and equally spaced around the perimeter, give a combined value exceeding 50 ohms immediately after having driven.

3.2 APPLICATIONS

3.2.1 Nonmetallic Exterior Walls with Metallic Roof

Bond metal roof sections together which are insulated from each other so that they are electrically continuous, having a surface contact of at least 3 square inches.

3.3 RESTORATION

Where sod has been removed, place sod as soon as possible after completing the backfilling. Restore, to original condition, the areas disturbed by

trenching, storing of dirt, cable laying, and other work. Overfill to accommodate for settling. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging or mulching in any restoration. Maintain disturbed surfaces and replacements until final acceptance.

3.4 FIELD QUALITY CONTROL

3.4.1 Lightning Protection and Grounding System Test

Test the lightning protection and grounding system to ensure continuity is not in excess of 1 ohm and that resistance to ground is not in excess of 25 ohms. Provide documentation for the measured values at each test point. Test the ground rod for resistance to ground before making connections to the rod. Tie the grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Include in the written report: Locations of test points, measured values for continuity and ground resistances, and soil conditions at the time that measurements were made. Submit results of each test to the Contracting Officer.

-- End of Section --

SECTION 26 51 00.00 22

INTERIOR LIGHTING
09/14

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2013) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A641/A641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B633	(2013) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

CALIFORNIA ENERGY COMMISSION (CEC)

CEC Title 24	(2008; Effective Jan 2010) California's Energy Efficiency Standards for Residential and Nonresidential Buildings

GREEN SEAL (GS)

GS-12	(1997) Occupancy Sensors

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IES)

IES HB-10	(2011) IES Lighting Handbook
IES LM-79	(2008) Electrical and Photometric Measurements of Solid-State Lighting Products
IES LM-80	(2008) Measuring Lumen Maintenance of LED Light Sources

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ANSLG C78.377	(2011) American National Standard for Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products
ANSI C78.901	(2005) American National Standard for Electric Lamps - Single Base Fluorescent Lamps--Dimensional and Electrical Characteristics
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ANSLG C78.81	(2013) American National Standard for Electric Lamps--Double-Capped Fluorescent Lamps--Dimensional and Electrical Characteristics
NEMA ANSLG C82.11	(2011) Lamp Ballasts - High-Frequency Fluorescent Lamp Ballasts
NEMA C82.77	(2002) Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
NEMA LL 1	(1997; R 2002) Procedures for Linear Fluorescent Lamp Sample Preparation and the TCLP Extraction

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2012; Amendment 1 2012) Life Safety Code
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 1310	(2011; Reprint Oct 2013) UL Standard for Safety Class 2 Power Units
UL 1598	(2008; Reprint Oct 2012) Luminaires
UL 773	(1995; Reprint Mar 2002) Standard for Plug-In, Locking Type Photocontrols for Use with Area Lighting
UL 773A	(2006; Reprint Nov 2013) Standard for Nonindustrial Photoelectric Switches for Lighting Control
UL 8750	(2009; Reprint May 2014) UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products
UL 924	(2006; Reprint Apr 2014) Standard for Emergency Lighting and Power Equipment
UL 935	(2001; Reprint Dec 2013) Standard for Fluorescent-Lamp Ballasts

1.2 RELATED REQUIREMENTS

Materials not considered to be lighting equipment or lighting fixture accessories are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Lighting fixtures and accessories mounted on exterior surfaces of buildings are specified in this section.

NOTE: Building mounted exterior fixtures are specified in Section 26 56 00 EXTERIOR LIGHTING.

1.3 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

b. Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

c. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IES LM-80.

d. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SYSTEM DESCRIPTION

1.4.1 Lighting Control System

Provide lighting control system as indicated. Lighting control equipment shall include, if indicated: Control modules, power packs, dimming

ballasts, occupancy sensors, and light level sensors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Data, drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES HB-10, as applicable, for the lighting system specified.

SD-03 Product Data

Fluorescent lighting fixtures; G

Fluorescent electronic ballasts; G

LED Luminaires; G

Dimmer switch; G

Photocell; G

Exit signs; G

Emergency lighting equipment; G

Occupancy sensors; G

Electronic dimming ballast; G

Dimming ballast controls; G

Environmental Data

Energy Efficiency

SD-06 Test Reports

LED Luminaire - IES LM-79 Test Report; G

LED Light Source - IES LM-80 Test Report; G

Operating test

Submit test results as stated in paragraph entitled "Field Quality Control."

Operational Service

Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

1.6 QUALITY ASSURANCE

1.6.1 Drawing Requirements

1.6.2 LED Luminaire - IES LM-79 Test Report

Submit test report on manufacturer's standard production model luminaire. Submittal shall include all photometric and electrical measurements, as well as all other pertinent data outlined under "14.0 Test Report" in IES LM-79.

1.6.3 LED Light Source - IES LM-80 Test Report

Submit report on manufacturer's standard production LED package, array, or module. Submittal shall include:

a. Testing agency, report number, date, type of equipment, and LED light source being tested.

b. All data required by IES LM-80.

1.6.3.1 Test Laboratories

Test laboratories for the IES LM-79 and IES LM-80 test reports shall be one of the following:

a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program.

b. One of the qualified labs listed on the Department of Energy - Energy Efficiency & Renewable Energy, Solid-State Lighting web site.

c. A manufacturer's in-house lab that meets the following criteria:

    1. Manufacturer has been regularly engaged in the design and production of high intensity discharge roadway and area luminaires and the manufacturer's lab has been successfully certifying these fixtures for a minimum of 15 years.

    2. Annual equipment calibration including photometer calibration in accordance with National Institute of Standards and Technology.

1.6.4 Fluorescent Electronic Ballasts

Submit ballast catalog data as required in the paragraph entitled "Fluorescent Lamp Electronic Ballasts" contained herein. As an option, submit the fluorescent fixture manufacturer's electronic ballast specification information in lieu of the actual ballast manufacturer's catalog data. This information shall include published specifications and sketches, which covers the information required by the paragraph entitled "Fluorescent Lamp Electronic Ballasts" herein. This information may be supplemented by catalog data if required, and shall contain a list of vendors with vendor part numbers.

1.6.5 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been

substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.6 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.6.6.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.6.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.7.1 Electronic Ballast Warranty

Furnish the electronic ballast manufacturer's warranty. The warranty period shall not be less than 5 years from the date of manufacture of the electronic ballast. Ballast assembly in the lighting fixture, transportation, and on-site storage shall not exceed 12 months, thereby permitting 4 years of the ballast 5 year warranty to be in service and energized. The warranty shall state that the malfunctioning ballast shall be exchanged by the manufacturer and promptly shipped to the using Government facility. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

1.7.2 LED Luminaire Warranty

Provide Luminaire Useful Life Certificate.

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render

satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

a. Provide a written five year on-site replacement warranty for material, fixture finish, and workmanship. On-site replacement includes transportation, removal, and installation of new products.

   1. Finish warranty shall include warranty against failure and against substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

   2. Material warranty shall include:

      (a) All power supply units (drivers).

      (b) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

b. Warranty period must begin on date of beneficial occupancy. Contractor shall provide the Contracting Officer signed warranty certificates prior to final payment.

PART 2 PRODUCTS

2.1 FLUORESCENT LIGHTING FIXTURES

UL 1598. Fluorescent fixtures shall have electronic ballasts unless specifically indicated otherwise.

2.1.1 Fluorescent Lamp Electronic Ballasts

The electronic ballast shall as a minimum meet the following characteristics:

a. Ballast shall comply with UL 935, NEMA ANSLG C82.11, NFPA 70, and CEC Title 24 unless specified otherwise. Ballast shall be 100 percent electronic high frequency type with no magnetic core and coil components. Ballast shall provide transient immunity as recommended by IEEE C62.41.1 and IEEE C62.41.2. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.

b. Power factor shall be 0.95 (minimum).

c. Ballast shall operate at a frequency of 20,000 Hertz (minimum). Ballast shall be compatible with and not cause interference with the operation of occupancy sensors or other infrared control systems. Provide ballasts operating at or above 40,000 Hertz where available.

d. Ballast shall have light regulation of plus or minus 10 percent lumen output with a plus or minus 10 percent input voltage regulation. Ballast shall have 10 percent flicker (maximum) using any compatible lamp.

e. Ballast factor shall be between 0.85 (minimum) and 1.00 (maximum). Current crest factor shall be 1.7 (maximum).

f. Ballast shall be UL listed Class P with a sound rating of "A."

g. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.

h. Ballasts shall be programmed start unless otherwise indicated. Programmed start ballasts may operate lamps in a series circuit configuration. Provide series/parallel wiring for programmed start ballasts where available.

i. Ballasts for compact fluorescent fixtures shall be programmed start.

j. Ballasts for T-5 and smaller lamps shall have end-of-life protection circuits as required by NEMA ANSLG C78.81 and ANSI C78.901 as applicable.

k. Ballast shall be capable of starting and maintaining operation at a minimum of 0 degrees F unless otherwise indicated.

l. Electronic ballast shall have a full replacement warranty of 5 years from date of manufacture as specified in paragraph entitled "Electronic Ballast Warranty" herein.

2.1.1.1 T-8 Lamp Ballast

a. Total harmonic distortion (THD): Shall be 20 percent (maximum).

b. Input wattage: As indicated..

2.1.1.2 F17T8 Lamp Ballast

a. Total harmonic distortion (THD): Shall be 25 percent (maximum).

b. Input wattage:

1. 34 watts (maximum) when operating two F17T8 lamps.

2.1.2 Fluorescent Lamp Electronic Dimming Ballast

The electronic ballast shall as a minimum meet the following characteristics:

a. Ballast shall comply with NEMA ANSLG C82.11, UL 935, and NFPA 70, unless specified otherwise. Ballast shall provide transient immunity as recommended by IEEE C62.41.1 and IEEE C62.41.2. Ballast dimming capability range shall be from 100 to 5 percent (minimum range) of light output, flicker free. Ballast shall start lamp at any preset light output setting without first having to go to full light output. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.

b. Power factor shall be 0.95 (minimum) at full light output, and 0.90 (minimum) over the entire dimming range.

c. Ballast shall operate at a frequency of 20,000 Hertz (minimum). Ballast shall be compatible with and not cause interference with the operation of occupancy sensors or other infrared control systems. Provide ballasts operating at or above 40,000 Hertz where available.

d. Ballast factor at full light output shall be between 0.85 (minimum) and 1.00 (maximum). Current crest factor shall be 1.7 (maximum).

e. Ballast shall be UL listed Class P with a sound rating of "A."

f. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.

g. Ballast shall be programmed start. Ballast may operate lamps in a series circuit configuration. Provide series/parallel wiring for programmed start ballasts where available.

h. Ballasts for compact fluorescent fixtures shall be programmed start.

i. Ballast shall be capable of starting and maintaining operation at a minimum of 0 degrees F unless otherwise indicated.

j. Total harmonic distortion (THD): Shall be 20 percent (maximum) over the entire dimming range.

k. Ballasts for T-5 and smaller lamps shall have end-of-life protection circuits as required by NEMA ANSLG C78.81 and ANSI C78.901 as applicable.

2.1.2.1 T-8 Lamp Ballast

Input wattage, for indicated lamp quantity shall be:

a. 35 watts (maximum) when operating one F32T8 lamp.

b. 70 watts (maximum) when operating two F32T8 lamps.

c. 104 watts (maximum) when operating three F32T8 lamps.

2.1.3 Dimming Ballast Controls

The dimming ballast controls shall be a slide dimmer with on/off control. The slide dimmer shall be compatible with the ballast and control the ballast light output over the full dimming range. Dimming ballast controls shall be approved by the ballast manufacturer.

2.1.4 Fluorescent Lamps

a. T-8 rapid start low mercury lamps shall be rated 32 watts (maximum), 2800 initial lumens (minimum), CRI of 80 (minimum), color temperature as needed, and an average rated life of 20,000 hours. Low mercury lamps shall have passed the EPA Toxicity Characteristic Leachate Procedure (TCLP) for mercury by using the lamp sample preparation procedure described in NEMA LL 1.

b. T-8 instant start lamp, 59 watts (maximum), nominal length of 96 inches, minimum CRI of 75, 5700 initial lumens, color temperature as indicated, and average rated life of 15,000 hours.

c. Compact fluorescent lamps shall be: CRI 80, minimum, as indicated, 10,000 hours average rated life, and as follows:

1. T-4, twin tube, rated as indicated.

2. T-4, double twin tube, rated as indicated.

Average rated life is based on 3 hours operating per start.

2.1.5 Compact Fluorescent Fixtures

Compact fluorescent fixtures shall be manufactured specifically for compact fluorescent lamps with ballasts integral to the fixture. Providing assemblies designed to retrofit incandescent fixtures is prohibited except when specifically indicated for renovation of existing fixtures. Fixtures shall use lamps as indicated, with a minimum CRI of 80.

2.1.6 Open-Tube Fluorescent Fixtures

Provide with self-locking sockets, or lamp retainers (two per lamp).

2.2 LED LUMINAIRES

UL 1598, NEMA C82.77 and UL 8750. Provide luminaires as indicated in luminaire schedule and plates or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. All luminaires of the same type shall be provided by the same manufacturer. Details, shapes, and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs, light distribution and brightness characteristics, and of equal finish and quality will be acceptable as approved.

2.2.1 General Requirements

a. LED luminaire housings shall be die cast or extruded aluminum.

b. LED luminaires shall be rated for operation within an ambient temperature range of minus 22 degrees F to 104 degrees F.

c. Luminaires shall be UL listed for wet locations per UL 1598 where indicated.

d. LED luminaires shall produce a minimum efficacy of 70 lumens per watt driven at a maximum 600 mA, tested per IES LM-79. Theoretical models of initial raw LED lumens per watt are not acceptable.

e. Luminaires shall have IES distribution and NEMA field angle classifications as indicated in luminaire schedule on project plans per IES HB-10.

f. Housing finish shall be baked-on enamel, anodized, or baked-on powder coat paint. Finish shall be capable of surviving ASTM B117 salt fog environment testing for 2500 hours minimum without blistering or peeling.

g. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.

h. The finish color shall be as indicated in the luminaire schedule or detail on the project plans.

i. Luminaire lenses shall be constructed of clear or frosted tempered glass or UV-resistant acrylic.

j. Incorporate modular electrical connections, and construct luminaires to allow replacement of all or any part of the optics, heat sinks, power supply units, ballasts, surge suppressors and other electrical components using only a simple tool, such as a manual or cordless electric screwdriver.

k. Luminaires shall have a nameplate bearing the manufacturer's name, address, model number, date of manufacture, and serial number securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

l. All factory electrical connections shall be made using crimp, locking, or latching style connectors. Twist-style wire nuts are not acceptable.

2.2.2 LED Light Sources

a. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377:

Nominal CCT: 3000 degrees K: 3045 plus or minus 175 degrees K

Nominal CCT: 3500 degrees K: 3465 plus or minus 245 degrees K

Nominal CCT: 4000 degrees K: 3985 plus or minus 275 degrees K

b. Color Rendering Index (CRI) shall be:

Greater than or equal to 80 for 3000 - 3500 degrees K light sources.

Greater than or equal to 70 for 4000 - 4500 degrees K light sources.

c. Color Consistency:

Manufacturer shall utilize a maximum 4-step MacAdam ellipse binning tolerance for color consistency of LEDs used in luminaires.

2.2.3 LED Power Supply Units (Drivers)

UL 1310. LED Power Supply Units shall meet the following requirements:

a. Minimum efficiency shall be 85 percent.

b. Drive current per LED shall not exceed 600 mA, plus or minus 10 percent.

c. Shall be rated to operate between ambient temperatures of minus 22 degrees F and 104 degrees F.

d. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120 V to 480 V nominal.

e. Operating frequency shall be: 50 or 60 Hz.

f. Power Factor (PF) shall be greater than or equal to 0.90.

g. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.

h. Shall meet requirements of FCC Part 15 (47 CFR 15), Class B.

i. Shall be RoHS-compliant.

j. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.

k. Power supplies in luminaires shall be UL listed with a sound rating of A.

l. Shall be dimmable, and compatible with a standard dimming control circuit of 0 - 10V or other approved dimming system.

m. Shall be equipped with over-temperature protection circuit that turns light source off until normal operating temperature is achieved.

2.2.4 Surge Protection

Provide surge protection integral to luminaire to meet "C Low" waveforms as defined in IEEE C62.41.2, Scenario 1 Location Category C.

2.3 RECESS- AND FLUSH-MOUNTED FIXTURES

Provide type that can be relamped from the bottom. Access to ballast shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as indicated.

2.4 SUSPENDED FIXTURES

Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended fixtures shall have twin-stem hangers. Multiple-unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18 inch diameter.

2.5 SWITCHES

2.5.1 Toggle Switches

Provide toggle switches as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.6 PHOTOCELL

UL 773 or UL 773A. Photocells shall be hermetically sealed, cadmium sulfide or silicon diode light sensor type, rated for fixture provided, with single-pole, single-throw contacts. Photocell shall be designed to fail to the ON position. Housing shall be rated to operate within a temperature range of minus 40 to 158 degrees F. Photocell shall turn on at 3 footcandles and turn off at 2 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources.

2.7 EXIT SIGNS

UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered, remote-powered type. Exit signs shall use no more than 5 watts.

2.7.1 Self-Powered LED Type Exit Signs (Battery Backup)

Provide with automatic power failure device, test switch, pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water, for a period of not less than 5 years. LED exit sign shall have emergency run time of 1 1/2 hours (minimum). The light emitting diodes shall have rated lamp life of 70,000 hours (minimum).

2.8 OCCUPANCY SENSORS

UL listed. Comply with GS-12. Occupancy sensors and power packs shall be designed to operate on the voltage indicated. Sensors and power packs shall have circuitry that only allows load switching at or near zero current crossing of supply voltage. Occupancy sensor mounting as indicated. Sensor shall have an LED occupant detection indicator. Sensor shall have adjustable sensitivity and adjustable delayed-off time range of 5 minutes to 15 minutes. Wall mounted sensors shall match the color of adjacent wall plates as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, ceiling mounted sensors shall be white. Ceiling mounted sensors shall have 360 degree coverage unless otherwise indicated.

a. Ultrasonic sensor shall be crystal controlled and shall not cause detection interference between adjacent sensors.

b. Infrared sensors shall have a daylight filter. Sensor shall have a fresnel lens that is applicable to space to be controlled.

c. Ultrasonic/Infrared Combination Sensor

2.9 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

2.9.1 Wires

ASTM A641/A641M, galvanized regular coating, soft temper, 12 gage.

2.9.2 Straps

Galvanized steel, one by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.9.3 Rods

Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

2.10 EQUIPMENT IDENTIFICATION

2.10.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a

conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.10.2 Labels

Provide labeled luminaires in accordance with UL 1598 requirements. All luminaires shall be clearly marked for operation of specific light sources and ballasts according to proper lamp type. The following lamp characteristics shall be noted in the format "Use Only _____":

a. Light source tube diameter code (e.g., T-4, T-5, T-8), tube quantity configuration (e.g., twin, quad, triple), base type (e.g., G24q-2, GX 24 q-4), and nominal wattage for fluorescent and compact fluorescent luminaires.

b. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.11 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

3.1.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15 percent of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. Provide 10 percent spare lamps of each type from the original manufacturer.

3.1.2 Lighting Fixtures

Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of four

wires, straps or rods per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of four wires or straps or rods per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires or straps or rods for lighting fixture support in this section. Lighting fixtures installed in suspended ceilings shall also comply with the requirements of Section 09 51 00 ACOUSTICAL CEILINGS.

3.1.3 Suspended Fixtures

Suspended fixtures shall be provided with 45 degree swivel hangers so that they hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, canopy and fixture shall be capable of 45 degree swing. Pendants, rods, or chains 4 feet or longer excluding fixture shall be braced to prevent swaying using three cables at 120 degree separation. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown. Maximum distance between suspension points shall be 10 feet or as recommended by the manufacturer, whichever is less.

3.1.4 Ballasts

3.1.4.1 Remote Ballasts

Remote type ballasts or transformers, where indicated, shall be mounted in a well ventilated, easily accessible location, within the maximum operating distance from the lamp, as designated by the manufacturer.

3.1.4.2 Electronic Dimming Ballasts

All electronic dimming ballasts controlled by the same controller shall be of the same manufacturer. All fluorescent lamps on electronic dimming ballast control shall be seasoned or burned in at full light output for 100 hours before dimming.

3.1.5 Exit Signs and Emergency Lighting Units

Wire exit signs and emergency lighting units ahead of the switch to the normal lighting circuit located in the same room or area.

3.1.5.1 Exit Signs

Wire exit signs on separate circuits and serve from a separate breaker a fused disconnect switch. Signs shall have only one control, which shall be

the separate breaker. Paint control device red and provide lockout.

3.1.6 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.

3.1.7 Occupancy Sensor

Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage shall provide hand and arm motion detection for office and administration type areas and walking motion for industrial areas, warehouses, storage rooms and hallways. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations to maximize energy savings and to avoid nuisance activation and deactivation due to sudden temperature or airflow changes and usage. Set sensor "on" duration to 7 minutes.

3.1.8 Light Level Sensor

Locate light level sensor as indicated and in accordance with the manufacturer's recommendations. Adjust sensor for 50 footcandles or for the indicated light level at the typical work plane for that area.

3.2 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.3 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

3.3.1 Electronic Dimming Ballast

Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

3.3.2 Occupancy Sensor

Test sensors for proper operation. Observe for light control over entire area being covered.

-- End of Section --

SECTION 27 10 00

BUILDING TELECOMMUNICATIONS CABLING SYSTEM
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2013) Laminated Thermosetting Materials

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

ECIA EIA/ECA 310-E	(2005) Cabinets, Racks, Panels, and Associated Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-83-596	(2011) Indoor Optical Fiber Cables
ICEA S-90-661	(2012) Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables for Use in General Purpose and LAN Communications Wiring Systems Technical Requirements

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA/BICSI 568	(2006) Standard for Installing Building Telecommunications Cabling

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA WC 66	(2013) Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-1152	(2009) Requirements for Field Test

	Instruments and Measurements for Balanced Twisted-Pair Cabling
TIA-455-21	(1988a; R 2012) FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices
TIA-526-14	(2010b) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
TIA-526-7	(2002; R 2008) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
TIA-568-C.0	(2009; Add 1 2010; Add 2 2012) Generic Telecommunications Cabling for Customer Premises
TIA-568-C.1	(2009; Add 2 2011; Add 1 2012) Commercial Building Telecommunications Cabling Standard
TIA-568-C.2	(2009; Errata 2010) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-568-C.3	(2008; Add 1 2011) Optical Fiber Cabling Components Standard
TIA-569	(2012c; Addendum 1 2013; Errata 2013) Commercial Building Standard for Telecommunications Pathways and Spaces
TIA-606	(2012b) Administration Standard for the Telecommunications Infrastructure
TIA-607	(2011b) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA/EIA-598	(2014d) Optical Fiber Cable Color Coding
TIA/EIA-604-3	(2004b; R 2014) Fiber Optic Connector Intermateability Standard (FOCIS), Type SC and SC-APC, FOCIS-3

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 68	Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

UL 1286	(2008; Reprint Oct 2014) Office Furnishings
UL 1666	(2007; Reprint Jun 2012) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically

	in Shafts
UL 1863	(2004; Reprint Nov 2012) Communication Circuit Accessories
UL 444	(2008; Reprint Apr 2010) Communications Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 50	(2007; Reprint Apr 2012) Enclosures for Electrical Equipment, Non-environmental Considerations
UL 514C	(2014) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 969	(1995; Reprint Sep 2014) Standard for Marking and Labeling Systems

1.2 RELATED REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM and Section 33 82 00 TELECOMMUNICATIONS, OUTSIDE PLANT (OSP), apply to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, TIA-606 and IEEE 100 and herein.

1.3.1 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates. (International expression for main cross-connect (MC).)

1.3.2 Building Distributor (BD)

A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made. (International expression for intermediate cross-connect (IC).)

1.3.3 Floor Distributor (FD)

A distributor used to connect horizontal cable and cabling subsystems or equipment. (International expression for horizontal cross-connect (HC).)

1.3.4 Telecommunications Room (TR)

An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling.

1.3.5 Entrance Facility (EF) (Telecommunications)

An entrance to the building for both private and public network service cables (including wireless) including the entrance point at the building wall and continuing to the equipment room.

1.3.6 Equipment Room (ER) (Telecommunications)

An environmentally controlled centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.3.7 Open Cable

Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is "open" to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.

1.3.8 Open Office

A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.

1.3.9 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.4 SYSTEM DESCRIPTION

The building telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting cabling necessary to transport telephone and data (including LAN) between equipment items in a building. The horizontal system shall be wired in a star topology from the telecommunications work area to the floor distributor or campus distributor at the center or hub of the star. The backbone cabling and pathway system includes intrabuilding and interbuilding interconnecting cabling, pathway, and terminal hardware. The intrabuilding backbone provides connectivity from the floor distributors to the building distributors or to the campus distributor and from the building distributors to the campus distributor as required. The backbone system shall be wired in a star topology with the campus distributor at the center or hub of the star. The telecommunications contractor may be required to coordinate work effort within the telecommunications spaces with the Government.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Telecommunications drawings; G

Telecommunications Space Drawings; G

In addition to Section 01 33 00 SUBMITTAL PROCEDURES, provide shop drawings in accordance with paragraph SHOP DRAWINGS.

SD-03 Product Data

Telecommunications cabling (backbone and horizontal); G

Patch panels; G

Telecommunications outlet/connector assemblies; G

Equipment support frame; G

Connector blocks; G

Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Include performance and characteristic curves. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph REGULATORY REQUIREMENTS and as required in Section 01 33 00 SUBMITTAL PROCEDURES.

SD-06 Test Reports

Telecommunications cabling testing; G

SD-07 Certificates

Telecommunications Contractor Qualifications; G

Key Personnel Qualifications; G

Manufacturer Qualifications; G

Test plan; G

SD-09 Manufacturer's Field Reports

Factory reel tests; G

SD-10 Operation and Maintenance Data

Telecommunications cabling and pathway system Data Package 5; G

SD-11 Closeout Submittals

Record Documentation; G

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

In exception to Section 01 33 00 SUBMITTAL PROCEDURES, submitted plan drawings shall be a minimum of 11 by 17 inches in size using a minimum scale of 1/8 inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement,

control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

1.6.1.1 Telecommunications Drawings

Provide drawings in accordance with TIA-606. The identifier for each termination and cable shall appear on the drawings. Drawings shall depict final telecommunications installed wiring system infrastructure in accordance with TIA-606. The drawings should provide details required to prove that the distribution system shall properly support connectivity from the EF telecommunications and ER telecommunications, CD's and FD's to the telecommunications work area outlets. The following drawings shall be provided as a minimum:

a. T1 - Layout of complete building per floor - Building Area/Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways. Layout of complete building per floor. The drawing indicates location of building areas, serving zones, vertical backbone diagrams, telecommunications rooms, access points, pathways, grounding system, and other systems that need to be viewed from the complete building perspective.

b. T2 - Serving Zones/Building Area Drawings - Drop Locations and Cable Identification (ID’S). Shows a building area or serving zone. These drawings show drop locations, telecommunications rooms, access points and detail call outs for common equipment rooms and other congested areas.

c. T4 - Typical Detail Drawings - Faceplate Labeling, Firestopping, Americans with Disabilities Act (ADA), Safety, Department of Transportation (DOT). Detailed drawings of symbols and typicals such as faceplate labeling, faceplate types, faceplate population installation procedures, detail racking, and raceways.

1.6.1.2 Telecommunications Space Drawings

Provide T3 drawings in accordance with TIA-606 that include telecommunications rooms plan views, pathway layout (cable tray, racks, ladder-racks, etc.), mechanical/electrical layout, and rack, backboard and wall elevations. Drawings shall show layout of applicable equipment including incoming cable stub or connector blocks, building protector assembly, outgoing cable connector blocks, patch panels and equipment spaces and cabinet/racks. Drawings shall include a complete list of equipment and material, equipment rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Drawings may also be an enlargement of a congested area of T1 or T2 drawings.

1.6.2 Telecommunications Qualifications

Work under this section shall be performed by and the equipment shall be

provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for: The telecommunications system contractor, the telecommunications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

1.6.2.1 Telecommunications Contractor

The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems within the past 3 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor.

1.6.2.2 Key Personnel

Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this solicitation depending upon how many of the key roles each has successfully provided. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems within the past 3 years.

Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel.

In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this solicitation. Include specific experience in installing and testing telecommunications systems and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this solicitation. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

Indicate that all key persons are currently employed by the

telecommunications contractor, or have a commitment to the telecommunications contractor to work on this project. All key persons shall be employed by the telecommunications contractor at the date of issuance of this solicitation, or if not, have a commitment to the telecommunications contractor to work on this project by the date that the bid was due to the Contracting Officer.

Note that only the key personnel approved by the Contracting Officer in the successful proposal shall do work on this solicitation's telecommunications system. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the telecommunications contractor's key personnel requires approval from The Contracting Officer.

1.6.2.3 Minimum Manufacturer Qualifications

Cabling, equipment and hardware manufacturers shall have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3.

1.6.3 Test Plan

Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 21 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.6.4 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.5 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.6.5.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests,

is furnished.

1.6.5.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 DELIVERY AND STORAGE

Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

1.8 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, noncondensing.

1.9 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.10 MAINTENANCE

1.10.1 Operation and Maintenance Manuals

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the telecommunications cabling and pathway system, Data Package 5. Submit operations and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein not later than 1 month prior to the date of beneficial occupancy. In addition to requirements of Data Package 5, include the requirements of paragraphs TELECOMMUNICATIONS DRAWINGS, TELECOMMUNICATIONS SPACE DRAWINGS, and RECORD DOCUMENTATION. Ensure that these drawings and documents depict the as-built configuration.

1.10.2 Record Documentation

Provide T5 drawings including documentation on cables and termination hardware in accordance with TIA-606. T5 drawings shall include schedules to show information for cut-overs and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. T5 drawings shall be provided in hard copy format management software.

a. Cables - A record of installed cable shall be provided in accordance with TIA-606. The cable records shall include only the required data fields in accordance with TIA-606. Include manufacture date of cable with submittal.

b. Termination Hardware - A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be provided in accordance with TIA-606. Documentation shall include the required data fields in

accordance with TIA-606.

PART 2 PRODUCTS

2.1 COMPONENTS

Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

2.2 TELECOMMUNICATIONS PATHWAY

Provide telecommunications pathways in accordance with TIA-569 and as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide system furniture pathways in accordance with UL 1286.

2.3 TELECOMMUNICATIONS CABLING

Cabling shall be UL listed for the application and shall comply with TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3 and NFPA 70. Provide a labeling system for cabling as required by TIA-606 and UL 969. Ship cable on reels or in boxes bearing manufacture date for for unshielded twisted pair (UTP) in accordance with ICEA S-90-661 and optical fiber cables in accordance with ICEA S-83-596 for all cable used on this project. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.3.1 Backbone Cabling

2.3.1.1 Backbone Copper

Copper backbone cable shall be solid conductor, 24 AWG, 100 ohm, 25-pair, Category 3, UTP, in accordance with ICEA S-90-661, TIA-568-C.1, TIA-568-C.2 and UL 444, formed into 25 pair binder groups covered with a gray thermoplastic jacket and overall metallic shield. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular length marking intervals in accordance with ICEA S-90-661. Provide plenum (CMP) communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70.

2.3.1.2 Backbone Optical Fiber

Provide in accordance with ICEA S-83-596, TIA-568-C.3, UL 1666 and NFPA 70.

Cable shall be imprinted with fiber count, fiber type and aggregate length at regular intervals not to exceed 40 inches.

Provide single-mode(OS1), tight buffered fiber optic cable of quantity as indicated on drawings.

Provide 6 strands of tight buffered fiber optic multimode, 50/125-um diameter laser optimized(OM3) cable as indicated.

Provide plenum (OFNP) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit, and group color shall be in accordance with TIA/EIA-598.

Provide plenum (OFNP) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit, and group color shall be in accordance with TIA/EIA-598.

2.3.2 Horizontal Cabling

Provide horizontal cable in compliance with NFPA 70 and performance characteristics in accordance with TIA-568-C.1.

2.3.2.1 Horizontal Copper

Provide horizontal copper cable, UTP, 100 ohm in accordance with TIA-568-C.2, UL 444, ANSI/NEMA WC 66, ICEA S-90-661. Provide four each individually twisted pair, minimum size 24 AWG conductors, Category 6, with a thermoplastic jacket. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) and length marking at regular intervals in accordance with ICEA S-90-661. Provide plenum (CMP) communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. Cables installed in conduit within and under slabs shall be UL listed and labeled for wet locations in accordance with NFPA 70.

2.4 TELECOMMUNICATIONS SPACES

Provide connecting hardware and termination equipment in the telecommunications entrance facility and telecommunication equipment room to facilitate installation as shown on design drawings for terminating and cross-connecting permanent cabling. Provide telecommunications interconnecting hardware color coding in accordance with TIA-606.

2.4.1 Backboards

Provide void-free, interior grade A-C plywood 3/4 inch thick 4 by 8 feet sections, as indicated. Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible. Do not paint backboards. Backboards shall be provided on a minimum of three adjacent walls in the telecommunication spaces, and as indicated.

2.4.2 Equipment Support Frame

Provide in accordance with ECIA EIA/ECA 310-E and UL 50.

a. Racks, floor mounted modular type, 16-gage steel construction minimum,

treated to resist corrosion. Provide rack with vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and a surge protected power strip. Rack shall be compatible with 19-inch panel mounting..

2.4.3 Connector Blocks

Provide insulation displacement connector (IDC) Type 110 for Category 6 systems. Provide blocks for the number of horizontal and backbone cables terminated on the block plus 25 percent spare.

2.4.4 Cable Guides

Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 19 inches equipment racks and telecommunications backboards. Cable guides of ring or bracket type devices mounted on backboard for horizontal cable management and individually mounted for vertical cable management.

2.4.5 Patch Panels

Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Provide pre-connectorized copper patch cords for patch panels. Provide patch cords, as complete assemblies, with matching connectors as specified. Provide fiber optic patch cables with crossover orientation in accordance with TIA-568-C.3. Patch cords shall meet minimum performance requirements specified in TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3 for cables, cable length and hardware specified.

2.4.5.1 Modular to 110 Block Patch Panel

Provide in accordance with TIA-568-C.1 and TIA-568-C.2. Panels shall be third party verified and shall comply with EIA/TIA Category 6 requirements. Panel shall be constructed of 0.09 inches minimum aluminum and shall be wall mounted and compatible with an ECIA EIA/ECA 310-E 19 inches equipment rack. Panel shall provide 48 non-keyed, 8-pin modular ports, wired to T568B. Patch panels shall terminate the building cabling on Type 110 IDCs and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.

2.4.5.2 Fiber Optic Patch Panel

Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 16 gauge steel or 11 gauge aluminum minimum and shall be rack or wall mounted and compatible with a ECIA EIA/ECA 310-E 19 inches equipment rack. Panel shall provide 12 multimode and 12 single-mode adapters as duplex SC in accordance with TIA/EIA-604-3 with zirconia ceramic with alignment sleeves. Provide dust cover for unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides. Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.5.1 Outlet/Connector Copper

Outlet/connectors shall comply with FCC Part 68, TIA-568-C.1, and TIA-568-C.2. UTP outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA-568-C.2 Category 6 requirements. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568B. UTP outlet/connectors shall comply with TIA-568-C.2 for 200 mating cycles.

2.5.2 Optical Fiber Adapters(Couplers)

Provide optical fiber adapters suitable for duplex LC in Accordance with TIA/EIA-604-3 with zirconia ceramic alignment sleeves. Provide dust cover for adapters. Optical fiber adapters shall comply with TIA-455-21 for 500 mating cycles.

2.5.3 Optical Fiber Connectors

Provide in accordance with TIA-455-21. The connectors shall provide a maximum attenuation of 0.3 dB at 1300 nm with less than a 0.2 dB change after 500 mating cycles.

2.5.4 Cover Plates

Telecommunications cover plates shall comply with UL 514C, and TIA-568-C.1, flush design constructed of high impact thermoplastic material in color to match color of receptacle/switch cover plates specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide labeling in accordance with the paragraph LABELING in this section.

2.6 GROUNDING AND BONDING PRODUCTS

Provide in accordance with UL 467, TIA-607, and NFPA 70. Components shall be identified as required by TIA-606. Provide ground rods, bonding conductors, and grounding busbars as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.7 FIRESTOPPING MATERIAL

Provide as specified in Section 07 84 00 FIRESTOPPING.

2.8 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.9 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic,

0.125 inches thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inches high normal block style.

2.10 TESTS, INSPECTIONS, AND VERIFICATIONS

2.10.1 Factory Reel Tests

Provide documentation of the testing and verification actions taken by manufacturer to confirm compliance with TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-526-7 for single mode optical fiber, and TIA-526-14 for multimode optical fiber cables.

PART 3 EXECUTION

3.1 INSTALLATION

Install telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware in accordance with NECA/BICSI 568, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, NFPA 70, and UL standards as applicable. Provide cabling in a star topology network. Pathways and outlet boxes shall be installed as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Install telecommunications cabling with copper media in accordance with the following criteria to avoid potential electromagnetic interference between power and telecommunications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the telecommunications cabling. Cabling shall be run with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

3.1.1 Cabling

Install UTP, and optical fiber telecommunications cabling system as detailed in TIA-568-C.1, TIA-568-C.2, TIA-568-C.3. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable, bend radii shall not be less than four times the cable diameter. Cables shall be terminated; no cable shall contain unterminated elements. Cables shall not be spliced. Label cabling in accordance with paragraph LABELING in this section.

3.1.1.1 Open Cable

Use only where specifically indicated on plans for use in cable trays, or below raised floors. Install in accordance with TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3. Do not exceed cable pull tensions recommended by the manufacturer. Copper cable not in a wireway or pathway shall be suspended a minimum of 8 inches above ceilings by cable supports no greater than 60 inches apart. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items. Placement of cable parallel to power conductors shall be avoided, if possible; a

minimum separation of 12 inches shall be maintained when such placement cannot be avoided.

Plenum cable shall be used where open cables are routed through plenum areas. Cable routed exposed under raised floors shall be plenum rated. Plenum cables shall comply with flammability plenum requirements of NFPA 70. Install cabling after the flooring system has been installed in raised floor areas.

3.1.1.2 Backbone Cable

a. Copper Backbone Cable. Install intrabuilding backbone copper cable, in indicated pathways, between the campus distributor, located in the telecommunications entrance facility or room, the building distributors and the floor distributors located in telecommunications rooms and telecommunications equipment rooms as indicated on drawings.

b. Optical fiber Backbone Cable. Install intrabuilding backbone optical fiber in indicated pathways. Do not exceed manufacturer's recommended bending radii and pull tension. Prepare cable for pulling by cutting outer jacket 10 inches leaving strength members exposed for approximately 10 inches. Twist strength members together and attach to pulling eye. Vertical cable support intervals shall be in accordance with manufacturer's recommendations.

3.1.1.3 Horizontal Cabling

Install horizontal cabling as indicated on drawings. Do not untwist Category 6 UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide slack cable in the form of a figure eight (not a service loop) on each end of the cable, 10 feet in the telecommunications room, and 12 inches in the work area outlet.

3.1.2 Pathway Installations

Provide in accordance with TIA-569 and NFPA 70. Provide building pathway as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.1.3 Service Entrance Conduit, Overhead

Provide service entrance overhead as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEMS.

3.1.4 Cable Tray Installation

Install cable tray as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Only CMP and OFNP type cable shall be installed in a plenum.

3.1.5 Work Area Outlets

3.1.5.1 Terminations

Terminate UTP cable in accordance with TIA-568-C.1, TIA-568-C.2 and wiring configuration as specified. Terminate fiber optic cables in accordance with TIA-568-C.3.

3.1.5.2 Cover Plates

As a minimum, each outlet/connector shall be labeled as to its function

and a unique number to identify cable link in accordance with the paragraph LABELING in this section.

3.1.5.3 Cables

Unshielded twisted pair and fiber optic cables shall have a minimum of 12 inches of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

3.1.5.4 Pull Cords

Pull cords shall be installed in conduit serving telecommunications outlets that do not have cable installed.

3.1.6 Telecommunications Space Termination

Install termination hardware required for Category 6 and optical fiber system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

3.1.6.1 Connector Blocks

Connector blocks shall be wall mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Install in accordance with industry standard wire routing guides in accordance with TIA-569.

3.1.6.2 Patch Panels

Patch panels shall be mounted in equipment cabinet racks on the plywood backboard with sufficient ports to accommodate the installed cable plant plus 25 percent spares.

a. Copper Patch Panel. Copper cable entering a patch panel shall be secured to the panel as recommended by the manufacturer to prevent movement of the cable.

b. Fiber Optic Patch Panel. Fiber optic cable loop shall be provided as recommended by the manufacturer. The outer jacket of each cable entering a patch panel shall be secured to the panel to prevent movement of the fibers within the panel, using clamps or brackets specifically manufactured for that purpose.

3.1.6.3 Equipment Support Frames

Install in accordance with TIA-569:

a. Bracket, wall mounted. Mount bracket to plywood backboard in accordance with manufacturer's recommendations. Mount rack so height of highest panel does not exceed 78 inches above floor.

b. Cabinets, wall-mounted modular type. Mount cabinet to plywood backboard in accordance with manufacturer's recommendations. Mount cabinet so height of highest panel does not exceed 78 inches above floor.

3.1.7 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings as specified in Section 07 84 00 FIRESTOPPING.

3.1.8 Grounding and Bonding

Provide in accordance with TIA-607, NFPA 70 and as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.2 LABELING

3.2.1 Labels

Provide labeling in accordance with TIA-606. Handwritten labeling is unacceptable.

3.2.2 Cable

Cables shall be labeled using color labels on both ends with identifiers in accordance with TIA-606.

3.2.3 Termination Hardware

Workstation outlets and patch panel connections shall be labeled using color coded labels with identifiers in accordance with TIA-606.

3.3 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.3.1 Painting Backboards

If backboards are required to be painted, then the manufactured fire retardant backboard must be painted with fire retardant paint, so as not to increase flame spread and smoke density and must be appropriately labeled. Label and fire rating stamp must be unpainted.

3.4 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.5 TESTING

3.5.1 Telecommunications Cabling Testing

Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA-568-C.1, TIA-568-C.2, and TIA-568-C.3. Test equipment shall conform to TIA-1152. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

3.5.1.1 Inspection

Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for T568A or T568B pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1, TIA-568-C.2, and TIA-568-C.3. Visually confirm marking of outlets, cover plates, outlet/connectors, and patch panels.

3.5.1.2 Verification Tests

UTP backbone copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination but prior to being cross-connected.

For multimode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3 and TIA-526-14 using Method A, Optical Power Meter and Light Source for multimode optical fiber. For single-mode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3 and TIA-526-7 using Method A, Optical Power Meter and Light Source. Perform verification acceptance tests.

3.5.1.3 Performance Tests

Perform testing for each outlet and MUTOA as follows:

a. Perform Category 6 link tests in accordance with TIA-568-C.1 and TIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.

b. Optical fiber Links. Perform optical fiber end-to-end link tests in accordance with TIA-568-C.3.

3.5.1.4 Final Verification Tests

Perform verification tests for UTP and optical fiber systems after the complete telecommunications cabling and workstation outlet/connectors are installed.

a. Voice Tests. These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and DSN telephone call.

b. Data Tests. These tests assume the Information Technology Staff has a network installed and are available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

-- End of Section --

SECTION 28 23 23.00 10

CLOSED CIRCUIT TELEVISION SYSTEMS
02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

CONSUMER ELECTRONICS ASSOCIATION (CEA)

CEA 170	(1957) Electrical Performance Standards - Monochrome Television Studio Facilities

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
IEEE C2	(2012; Errata 1 2012; INT 1-4 2012; Errata 2 2013; INT 5-7 2013; INT 8-10 2014; INT 11 2015) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2014) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Report Documenting Changes to the Site
Site Survey Report; G

SD-02 Shop Drawings

As-built Drawings; G

SD-03 Product Data

Training Documentation; G

SD-06 Test Reports

Test Procedures and Reports
Original Copies of all Test Data; G
Report Describing All Results; G

SD-07 Certificates

Supplemental Quality Control
Letter of Certification

SD-08 Manufacturer's Instructions

Group V Technical Data Package

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals
Operator's Training Report

SD-11 Closeout Submittals

Data Entry; G

1.3 QUALITY ASSURANCE

1.3.1 Test Procedures and Reports

Test procedures shall explain, in detail, step-by-step actions and expected results demonstrating compliance with the requirements of the specification. Test reports shall be used to document results of the tests. Reports shall be submitted to the Government within 7 days after completion of each test.

1.3.2 As-Built Drawings

Maintain a separate set of drawings, elementary diagrams and wiring diagrams of the CCTV system to be used for as-built drawings. This set shall be accurately kept up to date with all changes and additions to the CCTV system and shall be delivered to the Government with the final endurance test report. In addition to being complete and accurate, this set of drawings shall be kept neat and shall not be used for installation purposes. Upon completion of the final system drawings, a representative

of the Government will review the final system work with the Contractor. If the final system work is not complete, the Contractor will be so advised and shall complete the work as required. Final drawings submitted with the endurance test report shall be finished drawings on mylar or vellum, and as AutoCAD or Microstation files on optical disk.

1.4 DELIVERY OF TECHNICAL DATA AND COMPUTER SOFTWARE

1.4.1 Group I Technical Data Package

1.4.1.1 System Drawings

The data package shall include the following:

a. System block diagram.

b. Security center CCTV equipment installation, interconnection with console equipment, block diagrams and wiring diagrams.

c. Camera wiring and installation drawings.

d. Pan/tilt mount wiring and installation drawings.

e. Interconnection with video signal transmission system, block diagrams and wiring diagrams.

f. Surge protection device installation.

1.4.1.2 Manufacturers' Data

The data package shall include manufacturers' data for all materials and equipment and security center equipment provided under this specification.

1.4.1.3 Certifications

All specified manufacturer's certifications shall be included with the data package.

1.4.2 Group II Technical Data Package

Verify that site conditions are in agreement with the design package. Submit to the Government a report documenting changes to the site, or conditions that affect performance of the system to be installed. For those changes or conditions which affect system installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. Do not correct any deficiency without written permission from the Government.

1.4.3 Group IV Technical Data Package

1.4.3.1 Operation and Maintenance Manuals

A draft copy of the operation and maintenance manuals, as specified for the Group V technical data package, shall be delivered to the Government prior to beginning the performance verification test for use during site testing.

1.4.3.2 Training Documentation

Lesson plans and training manuals for the training phases, including type of training to be provided with a sample training report, and a list of reference material, shall be delivered for approval.

1.4.3.3 Data Entry

Enter all data needed to make the system operational. Deliver the data to the Government on data entry forms, utilizing data from the contract documents, field surveys, and all other pertinent information in the Contractor's possession required for complete installation of the data base. Identify and request from the Government, any additional data needed to provide a complete and operational CCTV system. The completed forms shall be delivered to the Government for review and approval at least 90 days prior to the Contractor's scheduled need date.

1.4.4 Group V Technical Data Package

Final copies of each of the manufacturer's commercial manuals arranged as specified bound in hardback, loose-leaf binders, shall be delivered to the Government within 30 days after completing the endurance test. The draft copy used during site testing shall be updated prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance. The number of copies of each manual to be delivered shall be as specified on DD Form 1423.

1.4.4.1 Functional Design Manual

The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes.

1.4.4.2 Hardware Manual

A manual shall describe all equipment furnished, including:

a. General hardware description and specifications.

b. Installation and checkout procedures.

c. Equipment electrical schematics and layout drawings.

d. System schematics and wiring lists.

e. System setup procedures.

f. Manufacturer's repair parts list indicating sources of supply.

g. Interface definition.

1.4.4.3 Software Manual

The software manual shall describe the functions of all software, and shall include all other information necessary to enable proper loading, testing and operation, including:

a. Definitions of terms and functions.

b. Procedures for system boot-up.

c. Description of using the programs.

d. Description of required operational sequences.

e. Directory of all disk files.

f. Description of all communications protocols, including data formats, command characters, and a sample of each type of data transfer.

1.4.4.4 Operator's Manual

The operator's manual shall explain all procedures and instructions for operation of the system including:

a. Cameras and video recording equipment.

b. Use of the software.

c. Operator commands.

d. System start-up and shut-down procedures.

e. Recovery and restart procedures.

1.5 ENVIRONMENTAL REQUIREMENTS

1.5.1 Field Equipment

The cameras and all other field equipment shall be rated for continuous operation under ambient environmental conditions of 14 to 120 degrees F using no auxiliary heating or cooling equipment. Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, wind loading, ice loading, and vibration conditions specified or encountered for the installed location.

1.5.2 Existing Conditions

Visit the site and verify that site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Government in a report as defined in paragraph Group II Technical Data Package. Do not take any corrective action without written permission from the Government.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 General

Configure the system as described and shown. All television equipment shall conform to CEA 170 specifications. Include in the system all connectors, adapters, and terminators necessary to interconnect all equipment. Supply all cabling necessary to interconnect the closed circuit television (CCTV) equipment installed in the Security Center, and interconnect equipment installed at remote control/monitoring stations. If the CCTV system is installed for use with an Electronic Security System (ESS) interface the CCTV system with the ESS.

2.1.2 Power Line Surge Protection

Protect all equipment connected to AC power from surges. Equipment protection shall withstand surge test waveforms described in IEEE C62.41.1 and IEEE C62.41.2. Fuses shall not be used for surge protection.

2.1.3 Video and Sync Signal Transmission Line Surge Protection

All cable, except fiber optic cable, used for sync or video signal transmission shall include protective devices to safeguard the CCTV equipment against surges. The surge suppression device shall not attenuate or reduce the video or sync signal under normal conditions. The surge suppression device shall be capable of dissipating not less than 1500 watts for 1 millisecond, and the response time from zero volts to clamping shall not be greater than 5 nanoseconds. Fuses shall not be used for surge protection.

2.1.4 Control Line Surge Protection

All cables and conductors, except fiber optic cables, which serve as communication, control, or signal lines shall be protected against surges and shall have surge protection installed at each end. Protection shall be furnished at the equipment and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 3 feet of the building cable entrance. Fuses shall not be used for surge protection. Test the inputs and outputs in both normal mode and common mode using the following waveforms:

a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

2.1.5 Electrical Requirements

Electrically powered CCTV equipment shall operate on 120 volt 60 Hz AC sources as shown. Equipment shall be able to tolerate variations in the voltage source of plus or minus 10 percent, and variations in the line frequency of plus or minus 2 percent with no degradation of performance.

2.2 MATERIALS AND EQUIPMENT

Provide system hardware and software components produced by manufacturers

regularly engaged in the production of CCTV equipment. Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's name and address, and the model and serial number in a conspicuous place. Equipment located at the security center or a remote control/monitoring station shall be rack mounted as shown. Both Television and Computing devices shall comply with 47 CFR 15, Subpart B.

2.3 ENCLOSURES

Provide metallic enclosures as needed for equipment not housed in racks or supplied with a housing. The enclosures shall be as specified or shown.

2.3.1 Interior

Enclosures to house equipment in an interior environment shall meet the requirements of NEMA 250 Type 12.

2.3.2 Exposed-to-Weather

Enclosures to house equipment in an outdoor environment shall meet the requirements of NEMA 250 Type 4X.

2.3.3 Corrosion-Resistant

Enclosures to house equipment in a corrosive environment shall meet the requirements of NEMA 250 Type 4X.

2.4 TAMPER PROVISIONS

2.4.1 Enclosure Covers

Covers of pull and junction boxes provided to facilitate installation of the system need not be provided with tamper switches if they contain no splices or connections, but shall be protected by tack welding or brazing the covers in place. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the security system.

2.4.2 Conduit-Enclosure Connections

All conduit-enclosure connections shall be protected by tack welding or brazing the conduit to the enclosure. Tack welding or brazing shall be done in addition to standard conduit-enclosure connection methods as described in NFPA 70.

2.5 SOLID STATE CAMERAS

2.5.1 Interior Dome Camera System

The interior dome camera system shall offer multiple simultaneous video streams with up to 1 megapixel (MPx) 1280 by 720 resolution, auto iris and varifocal lens. The camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement. The camera shall feature an unsupervised/supervised alarm input, relay output and line level/external microphone input connections and built-in microphone. The interior dome camera system shall provide a service video stream in addition to and

independent of the video streams. The camera shall provide advanced low-light capabilities for day/night models with sensitivity down to 0.005 lux in color and 0.0013 lux in monochrome. The interior dome camera system shall support industry standard Power over Ethernet (PoE) IEEE 802.3af, Class 3 to supply power to the camera over the network. The interior dome camera system shall support two simultaneous, configurable video streams. H.264 and MJPEG compression formats shall be available for primary and secondary streams with selectable Unicast and Multicast protocols. The camera shall provide 802.1x port security to establish point-to-point access through a wired or wireless port using Extensible Authentication Protocol (EAP). Supported EAP methods shall include EAP-MD5, EAP-TLS, EAP-TTLS, EAP-PEAP and EAP-FAST. The interior dome camera system shall provide flicker correction.

2.6 CAMERA LENSES

Camera lenses shall be all glass with coated optics. The lens mount shall be a C or CS mount, compatible with the cameras selected. The lens shall be supplied with the camera, and shall have a maximum f-stop opening of f/1.2 or the maximum available for the focal length specified. The lens shall be equipped with an auto-iris mechanism unless otherwise specified. Lenses having auto iris, manual iris, or zoom and focus functions shall be supplied with connectors, wiring, receiver/drivers, and controls as needed to operate the lens functions. Lenses shall have sufficient circle of illumination to cover the image sensor evenly. Lenses shall not be used on a camera with an image format larger than the lens is designed to cover. Interior and Exterior fixed camera lens shall be a 3-50 mm varifocal autoiris. Exterior PTZ camera lens shall be 36X optical zoom lens.

2.7 CAMERA HOUSINGS AND MOUNTS

The camera and lens shall be enclosed in a tamper resistant housing as specified below. Any ancillary housing mounting hardware needed to install the housing at the camera location shall be provided as part of the housing. The camera and lens contained in a camera housing shall be installed on a camera support as indicated. Any ancillary mounting hardware needed to install the support and to install the camera on the support shall be provided as part of the support. The camera support shall be capable of supporting the equipment to be mounted on it including wind and ice loading normally encountered at the site.

2.7.1 Interior Mount

The camera mount shall be suitable for either wall or ceiling mounting and shall have an adjustable head for mounting the camera. The wall mount and head shall be constructed of aluminum or steel with a corrosion-resistant finish. The head shall be adjustable for 360 degrees of pan, and not less than 90 degrees of tilt.

2.7.2 Low Profile Ceiling Mount

A tamperproof ceiling housing shall be provided for the camera. The housing shall be low profile and shall be suitable for replacement of 2 by 2 foot ceiling tiles. The housing shall be equipped with a camera mounting bracket and shall allow a 360 degree viewing setup.

2.7.3 Network Video Recorder (NVR)

The NVR software updates shall be downloadable from a publicly available website. The NVR shall support up to 128 combined IP and analog video streams, with up to 64 direct-attached analog cameras. The NVR shall provide 350 Mbps for RAID5, 300 Mbps for JBOD systems throughput for recording of analog and IP video streams, playback and export. The NVR shall have a 4 terabyte TB, SSD system drive to increase responsiveness. The NVR shall support recording of JPEG, MPEG-4 and H.264 IP streams. The NVR shall support an unlimited number of systems connected over a network. Each system shall contain two 1GB network ports; one for IP camera/encoder data, and one to connect to a network for client computer access. The NVR shall be viewed, managed, and played back through a single user interface. The NVR shall allow expansion of IP video channel capacity through a licensing without any hardware modification. The NVR shall support network health and monitoring utilizing third-party SNMP monitoring tools.

2.8 WIRE AND CABLE

Provide all wire and cable not indicated as Government Furnished Equipment. All wire and cable components shall be able to withstand the environment the wire or cable is installed in for a minimum of 20 years.

2.8.1 CCTV Equipment Video Signal Wiring

Twisted pair CAT6 cabling shall be provided as described in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM. Plenum or riser cables shall be IEEE C2 CL2P certified.

PART 3 EXECUTION

3.1 INSTALLATION

Install all system components, including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2 and as shown, and furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system. Raceways shall be furnished and installed as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. DTM shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring. All other electrical work shall be as specified in the above sections including grounding to preclude ground loops, noise, and surges from adversely affecting system operation.

3.1.1 Existing Equipment

Connect to and utilize existing video equipment, video and control signal transmission lines, and devices as shown. Video equipment and signal lines that are usable in their original configuration without modification may be reused with Government approval. Perform a field survey, including testing and inspection of all existing video equipment and signal lines intended to be incorporated into the CCTV system, and submit a report to the Government as part of the site survey report defined in paragraph "Group II Technical Data Package." For those items considered nonfunctioning, provide (with the report) specification sheets, or written functional requirements to support the findings and the estimated cost to

correct the deficiency. As part of the report, include the scheduled need date for connection to all existing equipment. Make written requests and obtain approval prior to disconnecting any signal lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Government approval of these requests. If any device fails after the Contractor has commenced work on that device, signal or control line, diagnose the failure and perform any necessary corrections to the equipment. The Government is responsible for maintenance and repair of Government equipment. The Contractor will be held responsible for repair costs due to Contractor negligence or abuse of Government equipment.

3.1.2 Enclosure Penetrations

All enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in such a manner that the cable is not damaged.

3.1.3 Cold Galvanizing

All field welds and brazing on factory galvanized boxes, enclosures, and conduits shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.

3.1.4 Interconnection of Console Video Equipment

Connect signal paths between video equipment with RG-6/U coaxial cable. Cables shall be as short as practicable for each signal path without causing strain at the connectors. Rack mounted equipment on slide mounts shall have cables of sufficient length to allow full extension of the slide rails from the rack.

3.1.5 Cameras

Install the cameras with the proper focal length lens as indicated for each zone; connect power and signal lines to the camera; set cameras with fixed iris lenses to the proper f-stop to give full video level; aim camera to give field of view as needed to cover the alarm zone; aim fixed mount cameras installed outdoors facing the rising or setting sun sufficiently below the horizon to preclude the camera looking directly at the sun; focus the lens to give a sharp picture over the entire field of view; and synchronize all cameras so the picture does not roll on the monitor when cameras are selected. Dome cameras shall have all preset positions defined and installed.

3.1.6 Video Recording Equipment

Install the video recording equipment as shown and as specified by the manufacturer; connect video signal inputs and outputs as shown and specified; connect alarm signal inputs and outputs as shown and specified; and connect video recording equipment to AC power.

3.2 SYSTEM STARTUP

Do not apply power to the CCTV system until the following items have been

completed:

a. CCTV system equipment items and DTM have been set up in accordance with manufacturer's instructions.

b. A visual inspection of the CCTV system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.

c. System wiring has been tested and verified as correctly connected as indicated.

d. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.

e. Power supplies to be connected to the CCTV system have been verified as the correct voltage, phasing, and frequency as indicated.

f. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

3.3 SUPPLEMENTAL QUALITY CONTROL

The following requirements supplement the quality control requirements specified elsewhere in the contract. Provide the services of technical representatives who are thoroughly familiar with all components and installation procedures of the installed IDS; and are approved by the Contracting Officer. These representatives will be present on the job site during the preparatory and initial phases of quality control to provide technical assistance. These representatives shall also be available on an as needed basis to provide assistance with follow-up phases of quality control. These technical representatives shall participate in the testing and validation of the system and shall submit certification that their respective system portions meet its contractual requirements.

3.4 TRAINING

3.4.1 General

Conduct training courses for designated personnel in the maintenance and operation of the CCTV system as specified. The training shall be oriented to the specific system being installed under this contract. The Contractor is responsible for furnishing all audio-visual equipment and all other training materials and supplies. Where the Contractor presents portions of the course through the use of audio-visual material, copies of the audio-visual materials shall be delivered to the Government, either as a part of the printed training manuals or on the same media as that used during the training sessions. A training day is 8 hours of instruction, including two 15 minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the facility. For guidance in planning the required instruction, assume the attendees will have a high school education or equivalent. Approval of the planned training schedule shall be obtained from the Government at least 30 days prior to the training.

3.4.2 Operator's Training

The course shall be taught at the project site for one day during or after the Contractor's field testing. A maximum of 12 personnel will attend the course. No part of the training given during this course will be counted toward completion of the performance verification test. The course shall consist of classroom instruction, hands-on training, instruction on the specific hardware configuration of the installed system, and specific instructions for operating the installed system. The course shall demonstrate system start up, system operation, system shutdown, system recovery after a failure, the specific hardware configuration, and operation of the system and its software. The students should have no unanswered questions regarding operation of the installed CCTV system. Prepare and insert additional training material in the training manuals when the need for additional material becomes apparent during instruction. Prepare a written Operator's Training Report after the completion of the course. List in the report the times, dates, attendees and material covered at each training session. Describe the skill level of each student at the end of this course. Submit the report before the end of the performance verification test. The course shall include:

a. General CCTV hardware, installed system architecture and configuration.

b. Functional operation of the installed system and software.

c. Operator commands.

d. Alarm interfaces.

e. Alarm reporting.

f. Fault diagnostics and correction.

g. General system maintenance.

h. Replacement of failed components and integration of replacement components into the operating CCTV system.

3.5 SITE TESTING

3.5.1 General

Provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Government will witness all performance verification and endurance testing. Written permission shall be obtained from the Government before proceeding with the next phase of testing. Original copies of all test data produced during performance verification and endurance testing shall be turned over to the Government at the conclusion of each phase of testing prior to Government approval of the test.

3.5.2 Contractor's Field Testing

Calibrate and test all equipment, verify DTM operation, place the integrated system in service, and test the integrated system. Test installed ground rods as specified in IEEE 142. Submit a report describing all results of functional tests, diagnostics, and calibrations including written certification to the Government that the installed complete system has been calibrated, tested, and is ready to begin

performance verification testing. The report shall also include a copy of the approved performance verification test procedure. Note any objects in the field of view that might produce highlights that could cause camera blinding. Note any objects in the field of view or anomalies in the terrain which may cause blind spots. Note if a camera cannot be aimed to cover the zone and exclude the rising or setting sun from the picture. Note night assessment capabilities and whether lights or vehicle headlights cause blooming or picture degradation. If any of the above conditions or other conditions exist that cause picture degradation or interfere with the camera field of view, inform the Contracting Officer. The field testing shall, as a minimum, include:

a. Verification that the video transmission system and any signal or control cabling have been installed, tested, and approved as specified.

b. Verification that all video sources and video outputs provide a full bandwidth signal that complies with CEA 170 at all video inputs.

c. Verification that all video signals are terminated properly.

d. Verification that all cameras are aimed and focused properly. Conduct a walk test of the area covered by each camera to verify the field of view.

e. Verification that cameras facing the direction of rising or setting sun are aimed sufficiently below the horizon so that the camera does not view the sun directly.

f. If vehicles are used in proximity of the assessment areas, verification of night assessment capabilities and determination if headlights cause blooming or picture degradation.

g. Verification that all cameras are synchronized and that the picture does not roll when cameras are switched.

h. Verification that the alarm interface to the IDS is functional and that automatic camera call-up is functional with appropriate video annotation for all designated ESS alarm points and cameras.

i. When pan/tilt mounts are used in the system, verification that the limit stops have been set correctly. Verification of all controls for pan/tilt or zoom mechanisms are operative and that the controls perform the desired function. If preposition controls are used, verification that all home positions have been set correctly, and have been tested for auto home function and correct home position.

j. When dome camera mounts are used in the system, verify that all preset positions are correct and that the dome also operates correctly in a manual control mode.

3.5.3 Performance Verification Test

Demonstrate that the completed CCTV system complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The performance verification test, as specified, shall not be started until receipt by the Contractor of written permission from the Government, based on the Contractor's written report. This shall include certification of successful completion of Contractor Field Testing as specified in

paragraph "Contractor's Field Testing," and upon successful completion of training as specified. Upon successful completion of the performance verification test, deliver test reports and other documentation as specified to the Government prior to commencing the endurance test.

3.6 MAINTENANCE AND SERVICE

Provide all required services, material and equipment necessary for the work to maintain the entire CCTV system in an operational state as specified for a period of 1 year after completion of the endurance test. Impacts on facility operations shall be minimized when performing scheduled adjustments or other unscheduled work.

3.6.1 Description of Work

The adjustment and repair of the CCTV system includes all computer equipment, software updates, signal transmission equipment, and video equipment. Provide the manufacturer's required adjustments and all other work necessary.

3.6.2 Personnel

Service personnel shall be qualified to accomplish all work promptly and satisfactorily. The Government shall be advised in writing of the name of the designated service representative, and of any changes in personnel.

3.6.3 Schedule of Work

Perform two inspections at 6-month intervals or less. This work shall be performed during regular working hours, Monday through Friday, excluding legal holidays. These inspections shall include:

a. Visual checks and operational tests of the CPU, switcher, peripheral equipment, interface panels, recording devices, monitors, video equipment electrical and mechanical controls, and a check of the picture quality from each camera.

b. Run system software and correct all diagnosed problems.

c. Resolve any previous outstanding problems.

3.6.4 Emergency Service

The Government will initiate service calls when the CCTV system is not functioning properly. Qualified personnel shall be available to provide service to the complete CCTV system. The Government shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at the site within 24 hours after receiving a request for service. The CCTV system shall be restored to proper operating condition within 3 calendar days after receiving a request for service.

3.6.5 Operation

Performance of scheduled adjustments and repair shall verify operation of the CCTV system as demonstrated by the applicable portions of the performance verification test.

3.6.6 Records and Logs

Keep records and logs of each task, and organize cumulative records for each major component, and for the complete system chronologically. Maintain a continuous log for all devices containing calibration, repair, and programming data. Keep logs available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the CCTV system.

3.6.7 Work Requests

Separately record each service call request, as received. The form shall include the serial number identifying the component involved, its location, date and time the call was received, nature of trouble, names of the service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the materials to be used, the time and date work started, and the time and date of completion. Deliver a record of the work performed within 5 days after work is completed.

3.6.8 System Modifications

Make any recommendations for system modification in writing to the Government. No system modifications, including operating parameters and control settings, will be made without prior approval of the Government. Incorporate any modifications made to the systems into the operations and maintenance manuals, and other documentation affected.

3.6.9 Software

Submit all software updates to the Government for approval. Upon Government approval, updates shall be accomplished in a timely manner, fully coordinated with the CCTV system operators, operation in the system verified, and incorporated into the operations and maintenance manuals, and software documentation. There shall be at least one scheduled update near the end of the first year's warranty period, at which time install and validate the latest released version of the manufacturer's software.

3.6.10 Maintenance Manual

The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

-- End of Section --

SECTION 28 31 63.00 20

ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM
10/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2	(2009; R 2014) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44	(2013) Safety Code for Elevators and Escalators

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60268-16	(2003; ED 4.0) Sound System Equipment - Part 16: Objective Rating Of Speech Intelligibility By Speech Transmission Index

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16	(2007) Fire Detection And Alarm Systems - Part 16: Sound System Control And Indicating Equipment
ISO 7240-19	(2007) Fire Detection and Alarm Systems — Part 19: Design, Installation, Commissioning and Service of Sound Systems for Emergency Purposes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 72	(2016) National Fire Alarm and Signaling Code
NFPA 720	(2015) Standard for the Installation of Carbon Monoxide(CO) Detection and Warning Equipment
NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 90	Private Land Mobile Radio Services

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2006; Change 3, 2013) Fire Protection Engineering for Facilities
UFC 3-600-10N	(2007) Fire Protection Engineering

UNDERWRITERS LABORATORIES (UL)

UL 1283	(2005; Reprint Feb 2013) Electromagnetic Interference Filters
UL 1449	(2014; Reprint MAR 2015) Surge Protective Devices
UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired
UL 2034	(2008; Reprint Mar 2015) Single and Multiple Station Carbon Monoxide Alarms
UL 268	(2009) Smoke Detectors for Fire Alarm Systems
UL 464	(2009; Reprint Apr 2012) Standard for Audible Signal Appliances
UL Electrical Constructn	(2012) Electrical Construction Equipment Directory
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein.

1.3 DESCRIPTION OF WORK

1.3.1 Scope

This work includes removing the existing fire alarm system and designing and providing a new, complete analog/addressable fire alarm system as

described herein and on the contract drawings for Building 678. The system shall include wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide system complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 72, UFC 3-600-01, and UFC 3-600-10N except as modified herein. Final quantity, layout, and coordination of devices is the responsibility of the Contractor.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Partial submittals and submittals not fully complying with the requirements and recommended practices of NFPA 72 and with this specification section shall be returned disapproved without review. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Provide six complete sets of submittals. The Mid-Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer will review and approve submittals.

SD-02 Shop Drawings; G

Provide point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems which are supervised or controlled by the system. Diagrams shall show connections from field devices to the FACP and initiating circuits, switches, relays and terminals.

Provide plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors.

Provide a complete description of the system operation in matrix format on the drawings.

Provide a complete list of device addresses and corresponding messages.

Include annotated catalog data, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components.

Provide complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

Battery power calculations; G

Submit shop drawings not smaller than 24 by 36 inches. As a

minimum, the shop drawing submittal shall include the items listed above.

SD-03 Product Data

Fire alarm control panel (FACP); G
Terminal cabinets/assemblies; G
Manual stations; G
Transmitters (including housing); G
Batteries; G
Battery chargers; G
Smoke sensors; G
Carbon monoxide detectors; G
Wiring and cable; G
Notification appliances; G
Addressable input modules; G
Addressable output modules; G
Amplifiers; G
Tone generators; G
Digitalized voice generators; G
Notification appliance circuit power supply panels; G
Smoke sensor testing procedures; G
Radio transmitter and interface panels; G

Submit data on proposed equipment, including, but not limited to the items listed above. Annotate descriptive data to show the specific model, type, options, and details of each item. Include UL or FM listing cards for equipment provided.

SD-06 Test Reports

Furnish preliminary test results to the Contracting Officer. Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer.

SD-07 Certificates

Qualifications of installer; G

SD-10 Operation and Maintenance Data

INTERIOR FIRE ALARM SYSTEM, Data Package 5; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Record drawing software; G

SD-11 Closeout Submittals

Prepare and submit to the Contracting Officer six sets of detailed as-built drawings. The drawings shall include complete wiring diagrams showing connections between devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of devices and equipment. The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop

drawings. The drawings shall be in pdf format on a compact disc, not less than 30 by 42 inches with 8 by 4 inch title block similar to contract drawings. These drawings shall be submitted within 2 weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test.

Submit the installer’s training history for the employees involved with this contract.

1.5 ADDITIONAL SUBMITTAL REQUIREMENTS

1.5.1 Battery Power Calculations

Verify that battery capacity exceeds supervisory and alarm power requirements.

a. Provide complete battery calculations for both the alarm and supervisory power requirements. Ampere hour requirements for each system component shall be submitted with the calculations.

b. Provide data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances, and 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

c. Provide data to indicate that the amplifiers have sufficient capacity to simultaneously drive fire alarm speakers at their actual tapped settings plus 50 percent spare capacity. Annotate data for each circuit on the drawings.

d. Provide a detailed description of the final acceptance testing procedures.

1.5.2 Qualifications of Installer

Design shall be by a National Institute for Certification in Engineering Technologies (NICET) Level III or Level IV Technician. All work shall be signed and sealed by the designer. Installation shall be accomplished by an electrical contractor with a minimum of 5 years' experience in the installation of fire alarm systems. The Contracting Officer may reject any proposed installer who cannot show evidence of such qualifications. The services of a technician provided by the control equipment manufacturer shall be provided to supervise installation, adjustments, and tests of the system. The Contractor shall furnish evidence that the fire alarm equipment supplier has an experienced and effective service organization which carries a stock of repair parts for the system to be furnished. The Contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the Contracting Officer and the receipt of as-built drawings and schematics of all equipment. Prior to installation, submit data for approval by the Mid-Atlantic Division Naval Facilities Engineering Command Fire Protection Engineer, showing that the Contractor has successfully installed addressable, analog intelligent interior fire alarm systems of the same type as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having such required experience. Include the names and locations of at least three installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate the

type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. Submit names and phone numbers of points of contact at each site.

1.5.3 Record Drawing Software

Furnish one set of compact discs containing CAD based drawings in DXF format of as-built drawings and schematics.

1.6 QUALITY ASSURANCE

Equipment and devices shall be compatible and operable with existing station fire alarm system and shall not impair reliability or operational functions of existing supervising station fire alarm system. Existing supervising station fire alarm system is Digitize Intellitize system with Micromux.

1.6.1 Regulatory Requirements

Devices and equipment for fire alarm service shall be listed by UL Fire Prot Dir or approved by FM APP GUIDE.

1.6.1.1 Requirements for Fire Protection Service

Equipment and material shall have been tested by UL and listed in UL Fire Prot Dir or approved by FM and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, they shall mean listed in UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.

1.6.1.2 Testing Services or Laboratories

Fire alarm and fire detection equipment shall be constructed in accordance with UL Fire Prot Dir, UL Electrical Constructn, or FM APP GUIDE.

1.6.2 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM, and listed or approved for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials.

1.6.3 Modification of References

a. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the Mid-Atlantic Division Naval Facilities Engineering Command Fire Protection Engineer.

b. The recommended practices stated in the manufacturer's literature or documentation shall be considered as mandatory requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather,

humidity, and temperature variation, dirt and dust, and other contaminants.

1.8 SPARE PARTS AND TOOLS

1.8.1 Interchangeable Parts

Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Contracting Officer at the time of the final acceptance testing.

1.8.2 Spare Parts

Furnish the following spare parts and accessories:

a. 4 audiovisual devices of each type installed.

b. 4 fuses for each fused circuit.

c. 2 manual stations.

d. 2 smoke sensors and bases of each type installed.

e. 3 test magnets/devices for each type of sensors installed.

f. 1 carbon monoxide sensor and base of each type installed.

1.8.3 Parts List

Furnish a list, in duplicate, of all other parts and accessories which the manufacturer of the system recommends to be stocked for maintenance.

1.9 KEYS

Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. Keys shall be CAT 60.

PART 2 PRODUCTS

2.1 INTERIOR FIRE ALARM SYSTEM DESIGN

2.1.1 Definitions

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

a. Analog/Addressable System: A system in which multiple signals are transmitted via the same conduction path to a remote fire alarm control unit and fire alarm control panel, decoded and separated so that each signal will initiate the specified response.

b. Hard Wired System: A system in which alarm and supervisory initiating devices are directly connected, through individual dedicated conductors, to a central control panel without the use of analog/addressable circuits or devices.

c. Interface Device: An addressable device which interconnects hard wired systems or devices to an analog/addressable system.

d. Fire Alarm Control Panel (FACP): A master control panel that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; and may provide transfer of condition to relays or devices. The panel has central processing, memory, and input and output terminals.

e. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door in which terminal strips are securely mounted.

2.1.2 System Operation

The system shall be a complete, supervised, noncoded, analog/addressable fire alarm system conforming to NFPA 72. The system shall have an interconnected riser loop or network having supervision as indicated on the contract drawings. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The system shall provide the following functions and operating features:

a. The FACP shall provide power, annunciation, supervision, and control for the system.

b. Provide Class B initiating device circuits.

c. Provide Class A signaling line circuits, isolated at each floor.

d. Provide Class B notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized.

e. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

f. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature which shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.

g. Provide a notification appliance silencing switch which, when activated, will silence the audible signal appliance, but will not affect the visual alarm indicator, the liquid crystal display, or the automatic notification of the fire department. This switch shall be overridden upon activation of a subsequent alarm.

h. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for 30 seconds.

i. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, fire reporting system, air handler shutdown, and elevator recall features.

Operation of this programming shall indicate this action on the FACP display and printer output.

j. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the fire department.

k. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

l. The system shall be capable of being programmed from the panel's keyboard. Programmed information shall be stored in non-volatile memory.

m. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.

n. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

o. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an HVAC system or an elevator system, the addressable fire alarm relay shall be within 3 feet of the emergency control device.

p. An alarm signal shall automatically initiate the following functions:

(1) Transmission of an alarm signal to the fire department.

(2) Visual indication of the device operated on the fire alarm control panel (FACP).

(3) Continuous actuation of all alarm notification appliances, except those in stairs or in elevator cabs.

(4) Recording of the event electronically in the history log of the FACP.

(5) Operation of a smoke sensor in an elevator lobby or other location associated with the automatic recall of elevators, shall recall the elevators in addition to other requirements of this paragraph.

(6) Operation of a duct smoke sensor shall shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph.

(7) Operation of a sprinkler waterflow switch serving an elevator machinery room shall operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1/CSA B44.

(8) Refer to the Contract Drawings for additional alarm requirements.

q. A supervisory signal shall automatically initiate the following functions:

(1) Visual indication of the device operated on the FACP and sound the audible alarm at the respective panel.

(2) Transmission of a supervisory signal to the fire department.

(3) Recording of the event electronically in the history log of the FACP.

(4) Refer to the Contract Drawings for additional supervisory requirements.

r. A trouble condition shall automatically initiate the following functions:

(1) Visual indication of the system trouble on the FACP and sound the audible alarm at the respective panel.

(2) Transmission of a trouble signal to the fire department.

(3) Recording of the event electronically in the history log of the FACP.

(4) Refer to the Contract Drawings for additional trouble requirements.

s. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be 15 seconds.

t. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed 200 seconds.

2.1.3 System Monitoring

a. Valves: Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves and valves at backflow preventers, whether supplied under this contract or existing, shall be electrically monitored to ensure its proper position. Each tamper switch shall be provided with a separate address.

2.1.4 Overvoltage and Surge Protection

a. Signaling Line Circuit Surge Protection: For systems having circuits located outdoors, communications equipment shall be protected against surges induced on any signaling line circuit and shall comply with the applicable requirements of IEEE C62.41.1 and IEEE C62.41.2. Cables and conductors, which serve as communications links, shall have surge protection circuits installed that are UL 1283 and UL 1449 listed.

b. Sensor Wiring Surge Protection: Digital and analog inputs and outputs shall be protected against surges induced by sensor wiring installed outdoors and as shown. The inputs and outputs shall be UL 1283 and UL 1449 listed.

2.1.5 Addressable Input Modules (AIM)

The input module shall provide an addressable input interface to the FACP for monitoring normally open or normally closed contact devices such as waterflow switches, valve supervisory switches, relays for output function actuation, etc. The input module shall contain an integral LED that flashes each time the input module is polled and is visible through the device cover plate.

2.1.6 Addressable Output Modules (AOM)

The output module shall be capable of operating as a relay (dry contact form C) for interfacing the FACP with other systems. The output module shall contain an integral LED that flashes each time the output module is polled and is visible through the device cover plate.

2.1.7 Smoke Sensors

2.1.7.1 Photoelectric Smoke Sensors

Provide addressable photoelectric smoke sensors as follows:

a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke sensors shall be listed for use with the fire alarm control panel.

b. Provide self-restoring type sensors which do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL listed as smoke-automatic fire sensors.

c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen which prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.

d. Provide twist lock bases for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.

e. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.

f. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.

    1. Primary status.

    2. Device type.

    3. Present average value.

    4. Present sensitivity selected.

    5. Sensor range (normal, dirty, etc.).

g. Provide sounder bases for detectors in dwelling units. Sounder base shall activate upon initiation of an alarm from any smoke detector within a dwelling unit. Audible characteristics shall be in accordance with NFPA 72 for sleeping areas.

2.1.7.2 Duct Smoke Sensors

Duct smoke sensors shall be analog/addressable photoelectric type as described in paragraph entitled "Photoelectric Smoke Sensors," and shall be provided in ductwork in accordance with NFPA 90A and in accordance with manufacturer’s recommendations.

2.1.7.3 Smoke Sensor Testing

Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test method. Submit smoke sensor testing procedures for approval.

2.1.8 Carbon Monoxide Detectors

Carbon monoxide detectors shall contain a carbon monoxide sensor in a surface-mount housing. The detection sensor shall be UL 2034 listed to initiate an alarm condition.

2.1.9 Electric Power

2.1.9.1 Primary Power

Provide primary power for the FACP from the normal AC service to the building where shown on the drawings. Power shall be 120 VAC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of circuits and devices. Make the service connection for the FACP at the main distribution panel where shown. Provide appropriate equipment to protect against power surges. Provide a separate NEMA 1 "general purpose enclosure" for the circuit breaker. The circuit breaker enclosure shall be painted red, marked "FIRE ALARM SYSTEM," provided with a red and white engraved plastic sign permanently affixed to the face of the switch, and provided with a lockable handle or cover.

2.1.10 Emergency Power Supply

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.

2.1.10.1 Batteries

Provide sealed, maintenance-free, lead acid batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. The battery system shall be maintained in a fully charged condition by means of a solid state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.

2.1.10.2 Capacity

Provide the batteries with sufficient capacity to operate the system under supervisory and trouble conditions, including audible trouble signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.

2.1.10.3 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 150 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged, the charger shall recharge the batteries back to 95 percent of full charge within 48 hours. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.1.11 System Field Wiring

2.1.11.1 Wiring Within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors which are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make connections with approved pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.

2.1.11.2 Terminal Cabinets

Provide a terminal cabinet where required by Contractor's design. Terminal size shall be appropriate for the size of the wiring to be connected. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet. Minimum size is 8 inches high by 8 inches.

2.1.11.3 Alarm Wiring

Signaling line circuits and initiating device circuit field wiring shall be copper, No. 16 AWG size conductors at a minimum. Notification appliance circuit conductors, that contain audible alarm devices, other than speakers, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be No. 12 AWG solid copper having similar insulation. Provide all wiring in rigid metal conduit or intermediate metal conduit. Electrical metallic tubing conduit is acceptable in dry locations not enclosed in concrete or where not subject to mechanical damage. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device circuits. Run conduit or tubing concealed unless specifically shown otherwise on the drawings. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. T-taps to signaling line circuits and notification appliance circuits are prohibited. Color coding is required for circuits and shall be maintained throughout the circuit.

2.1.11.4 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP, and fire alarm control unit shall contain a laminated drawing which indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

2.1.12 Fire Alarm Control Panel (FACP)

Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters of which at least 32 are field changeable.

2.1.12.1 Cabinet

Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Fire Alarm Control Panel" and shall not be less than one inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.1.12.2 Control Modules

Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and relays, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage.

2.1.12.3 Silencing Switches

a. Alarm Silencing Switch: Provide an alarm silencing switch at the FACP which shall silence the audible signal but not affect the visual alarm indicator. This switch shall be overridden upon activation of a

subsequent alarm.

b. Supervisory/Trouble Silencing Switch: Provide supervisory and trouble silencing switch which shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition.

2.1.12.4 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually resettable by switch from the FACP after the initiating device or devices have been restored to normal.

2.1.12.5 Fire Alarm Voice Message

A fire or carbon monoxide alarm shall activate notification appliance circuits. Textual audible appliances shall produce the tones indicated followed by a voice message which is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers on appropriate floors, but not in stairs or elevator cabs. The visual strobes and audible message shall automatically be broadcast throughout the building. A live voice message shall override the automatic audible output through use of a microphone input at the control panel. When using the microphone, live messages shall be broadcast through speakers in stairs, in elevator cabs, and throughout the building. The system shall be capable of operating all speakers at the same time. The digitalized voice message shall consist of a non-volatile (EPROM) microprocessor based input to the amplifiers. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction which could render the digitalized voice module inoperative shall automatically cause the slow whoop tone to take over all functions assigned to the failed unit. Messages shall utilize a female voice and shall be as indicated on the Contract Drawings.

2.1.12.6 Fire Alarm Signal

A fire alarm shall activate notification appliances throughout the building. Audible devices shall be fire alarm speakers which produce a three-pulse temporal pattern in accordance with NFPA 72, followed by the voice message as indicated on the Contract Drawings. Visual devices shall be strobes operating in accordance with NFPA 72.

2.1.12.7 Carbon Monoxide Alarm Signal

A carbon monoxide alarm shall activate notification appliances throughout the building. Audible devices shall be fire alarm speakers which produce a four-pulse temporal pattern in accordance with NFPA 720, followed by the voice message as indicated on the Contract Drawings. Visual devices shall be strobes operating in accordance with NFPA 720.

2.1.12.8 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile

processors, PROMS, or EPROMS.

2.1.12.9 Field Programmability

Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment.

2.1.12.10 Input/Output Modifications

The FACP shall contain features which allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the FACP.

2.1.12.11 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.1.12.12 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the instructions on the interior of the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Contracting Officer before being posted.

2.1.12.13 Walk Test

The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated on the system printer, but no other outputs occur.

2.1.12.14 History Logging

In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the control panel shall not clear the memory.

2.1.12.15 History Output

Each local control panel shall be capable of downloading history to printers and/or external drives.

2.1.13 Notification Appliance Circuit Power Supply Panels

Notification appliance circuit booster panels shall be UL listed and/or FM approved and of the same manufacturer as the FACP.

2.1.14 Amplifiers, Preamplifiers, Tone Generators

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 shall be housed in a terminal cabinet or in the fire alarm control panel. The system shall automatically operate and control all building fire alarm speakers except those installed in the stairs and within elevator cabs. The speakers in the stairs and elevator cabs shall operate only when the microphone is used to deliver live messages. Each amplifier shall have two channels; one to broadcast a message and the other for paging.

2.1.14.1 Construction

Amplifiers shall utilize computer grade solid state components and shall be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

2.1.14.2 Inputs

Each system shall be equipped with separate inputs from the tone generator, digitalized voice driver and panel mounted microphone. Microphone inputs shall be of the low impedance, balanced line type. Both microphone and tone generator input shall be operational on any amplifier.

2.1.14.3 Tone Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall be capable of producing a three-pulse temporal pattern in accordance with NFPA 72 and a four-pulse temporal pattern in accordance with NFPA 720, and shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.

2.1.14.4 Protection Circuits

Each amplifier shall be constantly supervised for any condition which could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual "amplifier trouble" indicator on the control panel, appropriate logging of the condition on the system printer, and other actions for trouble conditions as specified.

2.1.15 Manual Stations

Provide metal or plastic, semi-flush mounted, double action, addressable manual stations, which are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations which require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset

the station.

2.1.16 Notification Appliances

2.1.16.1 Fire Alarm Speakers

a. Provide fire alarm speakers with white grill, conforming to UL 464 having a minimum of three tap settings and separate terminations for each in and out connection. Tap settings shall include taps of 1/4, 1/2, and 1 watt. Speakers shall utilize the 1/2 watt tap in the system. Speakers shall have an output rating of 84 dBA at 10 feet as determined by the reverberant room test; data on peak output as determined in an anechoic chamber is not suitable. Speakers shall be capable of installation on standard 4 inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall mounted unit.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gage and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.

2.1.16.2 Visual Alarm Signals

Provide strobe light visual alarm signals with clear lens and white base marked "ALERT" in red letters, which operate on a supervised 24 volt DC circuit. The strobe lens shall comply with UL 1971 and conform to the Americans With Disabilities Act. The light pattern shall be dispersed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. The strobe flash output shall be a minimum of 15 candela based on the UL 1971 test. The strobe shall have a xenon flash tube. Visible appliances may be part of an audio-visual assembly. Where two or more appliances are located in the same room or corridor, provide synchronized operation.

2.1.16.3 Smoke Detector Sounder Bases

Where smoke detector sounder bases are required, the bases shall comply with the following:

a. Provide analog addressable smoke detector sounder bases for smoke detectors located in living units. Bases shall be programmed to sound when its smoke detector is activated and when any smoke detector located in the same living unit is activated. Sounder bases shall not activate upon general building fire alarms. Sounder bases shall silence upon activation of general building fire alarm messaging.

b. Sounder bases shall operate at a minimum of 75 dBA with a fundamental frequency of 520 Hz +/- 10 percent. Alarm signal shall be a square wave or provide equivalent awakening ability.

c. Provide 24 VDC powered sounder bases. Sounder bases shall be powered via the fire alarm system. Loss of power to a sounder base shall be annunciated at the FACP as a trouble condition.

d. For system manufacturers without listed bases meeting the 75 dBA, 520 hz, and square wave requirements; provide system alarm horns mounted

adjacent to the detector. Where horns are utilized in lieu of sounder bases, all requirements related to the provision of sounder bases shall apply to the alarm horn.

2.1.16.4 Fire Alarm Bells

Provide exterior surface-mounted bells suitable for use in an electrically supervised circuit. Bells shall be 10 inch vibrating type with a sound output rating of at least 90 dBA at 10 feet when tested in accordance with UL 464. Bells shall be listed for outdoor use and be mounted on a weatherproof backbox.

2.1.16.5 Connections

Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

2.1.17 Automatic Transmitters

2.1.17.1 Radio Transmitter and Interface Panels

Provide radio transmitter with antenna that is compatible with the existing supervising station fire alarm system. Transmitter shall have a means to transmit alarm, supervisory, and trouble conditions via a single transmitter. Provide transmitters in accordance with applicable portions of NFPA 72, Federal Communications Commission (FCC) 47 CFR 90. Protect the antenna from physical damage. Transmitter shall have a source of power for operation which conforms to NFPA 72. Transmitter shall be capable of initiating a test signal daily at any selected time. The existing supervising station fire alarm system is a Digitize Intellitize system with Micromux FACP interface.

2.1.17.2 Signals To Be Transmitted to the Base Receiving Station

See contract drawings for signals that shall be sent to the base receiving station.

2.2 NAMEPLATES

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

a. FACPs.

b. Automatic transmitter.

c. NAC Booster and Amplifier Panels.

Furnish to obtain approval by the Contracting Officer before installation. Obtain approval by the Contracting Officer for installation locations. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

2.3 WIRING

Provide wiring materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein.

PART 3 EXECUTION

3.1 INSTALLATION OF FIRE ALARM INITIATING AND INDICATING DEVICES

a. FACP: Locate the FACP where indicated on the drawings. Recess or Semi-recess the enclosure and mount as indicated on the drawings. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the FACP.

b. Manual Stations: Locate manual stations where shown on the drawings. Mount stations as indicated on the drawings.

c. Notification Appliance Devices: Locate notification appliance devices as required by NFPA 72. Mount assemblies as indicated on the drawings.

d. Smoke and Carbon Monoxide Sensors: Locate sensors as shown on the drawings on a 4 inch mounting box. Install sensors as indicated on the drawings.

3.2 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00 FIRESTOPPING.

3.3 PAINTING

Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas. Paint junction boxes red in unfinished areas. Fire alarm conduit shall be painted with 3/4-inch wide red bands every 20 feet and on both sides of a floor, wall, or ceiling penetration. Painting shall comply with Section 09 90 00 PAINTS AND COATINGS.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

a. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.

b. Preliminary Testing: Conduct preliminary tests to ensure that devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests." After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that panel functions

were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

c. Request for Formal Inspection and Tests: When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests to the Contracting Officer.

d. Final Testing: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. A final acceptance test will not be scheduled until the operation and maintenance (O&M) manuals are furnished to the Contracting Officer and the following are provided at the job site:

   1. The systems manufacturer's technical representative.

   2. Marked-up red line drawings of the system as actually installed.

   3. Loop resistance test results.

   4. Complete program printout including input/output addresses.

The final tests shall be witnessed by the Mid-Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer. At this time, any and all required tests shall be repeated at their discretion. Following acceptance of the system, as-built drawings and O&M manuals shall be delivered to the Contracting Officer for review and acceptance.

3.4.2 Minimum System Tests

Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:

a. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.

b. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.

c. Test each initiating and indicating device and circuit for proper operation and response at the control unit. Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test method. Testing of duct smoke detectors shall comply with the requirements of NFPA 72.

d. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.

e. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.

f. Determine that the system is operable under trouble conditions as specified.

g. Visually inspect wiring.

h. Test the battery charger and batteries.

i. Verify that software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Contracting Officer.

j. Verify that red-line drawings are accurate.

k. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

l. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

m. Disconnect the verification feature for smoke sensors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke sensors shall be conducted using canned smoke.

n. Measure the voltage drop at the most remote appliance on each notification appliance circuit.

3.4.2.1 Intelligibility Tests

Intelligibility testing of the System shall be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2. Following are the specific requirements for intelligibility tests:

a. Intelligibility Requirements: Verify intelligibility by measurement after installation.

b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is 0.7.

c. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast, and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.

d. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

    1. Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.

    2. Curving around any corners or obstructions, with a 12 inches clearance there from.

    3. Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by ISO 7240-19 and ISO 7240-16 as applicable. Use the mean

value of at least three readings to compute the intelligibility score at each test location.

3.5 INSTRUCTION OF GOVERNMENT EMPLOYEES

Equipment manufacturer shall provide 3 days on site. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises.

3.5.1 Instructor

Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm system.

3.5.2 Qualifications

Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work.

3.5.3 Required Instruction Time

Provide 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING
08/08

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Nonsaleable Materials; G

SD-04 Samples

Tree Wound Paint
Herbicide

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

2.1 TREE WOUND PAINT

Submit samples in cans with manufacturer's label of bituminous based paint of standard manufacture specially formulated for tree wounds.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Protect trees and vegetation to be left standing from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repairs of damage to existing utility lines that are indicated or made

known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Contracting Officer in ample time to minimize interruption of the service. Refer to Section 01 30 00 ADMINISTRATIVE REQUIREMENTS and Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS for additional utility protection.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 GRUBBING

Grubbing consists of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Remove material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Fill depressions made by grubbing with suitable material and compact to make the surface conform with the original adjacent surface of the ground.

3.5 DISPOSAL OF MATERIALS

3.5.1 Nonsaleable Materials

Written permission to dispose of such products on private property shall be filed with the Contracting Officer. Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 32 16 13

CONCRETE SIDEWALKS AND CURBS AND GUTTERS
04/08

PART 1 GENERAL

1.1 BASIS FOR PAYMENT

1.1.1 Sidewalks

Payment of the quantities of sidewalks measured as specified will be at the contract unit price per squareyard of the thickness specified.

1.1.2 Curbs and Gutters

Payment of the quantities of curbs and gutters measured as specified will be at the contract unit price per linear foot of each cross section.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(2005; R 2012) Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2015) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615/A615M	(2015a) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C143/C143M	(2012) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C171	(2007) Standard Specification for Sheet Materials for Curing Concrete
ASTM C172/C172M	(2014a) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the

	Pressure Method
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C31/C31M	(2012) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2004a; R 2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D5893/D5893M	(2010) Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D698	(2012) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

1.3 SYSTEM DESCRIPTION

1.3.1 General Requirements

Provide plant, equipment, machines, and tools used in the work subject to approval and maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Concrete

SD-06 Test Reports

Field Quality Control

1.5 ENVIRONMENTAL REQUIREMENTS

1.5.1 Placing During Cold Weather

Do not place concrete when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Make provisions to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing. Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.5.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

PART 2 PRODUCTS

2.1 CONCRETE

Provide concrete conforming to the applicable requirements of Section 03 30 00.00 10 CAST-IN-PLACE CONCRETE except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches. Submit copies of certified delivery tickets for all concrete used in the construction.

2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with ASTM C143/C143M.

2.1.3 Reinforcement Steel

Reinforcement bars shall conform to ASTM A615/A615M. Wire mesh reinforcement shall conform to ASTM A1064/A1064M.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C171, type optional, except that polyethylene film, if used, shall be white opaque.

2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

2.2.3 White Pigmented Membrane-Forming Curing Compound

White pigmented membrane-forming curing compound shall conform to ASTM C309, Type 2.

2.3 CONCRETE PROTECTION MATERIALS

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D1751 or ASTM D1752, 1/2 inch thick, unless otherwise indicated.

2.5 JOINT SEALANTS

Joint sealant, cold-applied shall conform to ASTM C920 or ASTM D5893/D5893M.

2.6 FORM WORK

Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.6.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted to 90 percent maximum density per ASTM D698.

3.1.1 Sidewalk Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING

Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope as indicated with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Place concrete in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete

shall be consolidated by tamping and spading or with an approved vibrator, and the surface shall be finished to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.4.1 Sidewalk Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

3.4.2 Sidewalk Expansion Joints

Expansion joints shall be formed with 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper. Joint filler shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with cold-applied joint sealant. Joint sealant shall be gray or stone in color. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.4.3 Reinforcement Steel Placement

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

3.5 CURING AND PROTECTION

3.5.1 General Requirements

Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.5.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.5.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.5.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet/gallon for the total of both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.5.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.5.3 Protection

Completed concrete shall be protected from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.5.4 Protective Coating

Protective coating, of linseed oil mixture, shall be applied to the exposed-to-view concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement. Concrete

to receive a protective coating shall be moist cured.

3.5.4.1 Application

Curing and backfilling operation shall be completed prior to applying two coats of protective coating. Concrete shall be surface dry and clean before each application. Coverage shall be by spray application at not more than 50 square yards/gallon for first application and not more than 70 square yards/gallon for second application, except that the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Coated surfaces shall be protected from vehicular and pedestrian traffic until dry.

3.5.4.2 Precautions

Protective coating shall not be heated by direct application of flame or electrical heaters and shall be protected from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Material shall not be applied at ambient or material temperatures lower than 50 degrees F.

3.6 FIELD QUALITY CONTROL

Submit copies of all test reports within 24 hours of completion of the test.

3.6.1 General Requirements

Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.6.2 Concrete Testing

3.6.2.1 Strength Testing

Provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C172/C172M. Cylinders for acceptance shall be molded in conformance with ASTM C31/C31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.6.2.2 Air Content

Determine air content in accordance with ASTM C173/C173M or ASTM C231/C231M. ASTM C231/C231M shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in

concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.6.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.6.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

3.6.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.7 SURFACE DEFICIENCIES AND CORRECTIONS

3.7.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.7.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

3.7.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

SECTION 32 17 24.00 10

PAVEMENT MARKINGS
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-1952	(2015; Rev F) Paint, Traffic and Airfield Markings, Waterborne

1.2 SYSTEM DESCRIPTION

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Submit lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

1.2.1 Paint Application Equipment

1.2.1.1 Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.2.1.2 Hand-Operated, Push-Type Machines

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application

of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

1.2.2 Surface Preparation Equipment

1.2.2.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

1.2.2.2 Waterblast Equipment

The water pressure shall be specified at 2600 psi at 140 degrees F in order to adequately clean the surfaces to be marked.

1.2.3 Marking Removal Equipment

Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

1.2.3.1 Shotblasting Equipment

Shotblasting equipment shall be capable of producing an adjustable depth of removal of marking and pavement. Each unit shall be self-cleaning and self-contained, shall be able to confine dust and debris from the operation, and shall be capable of recycling the abrasive for reuse.

1.2.3.2 Chemical Equipment

Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradable residue.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; G
Composition Requirements
Qualifications

SD-06 Test Reports

Sampling and Testing

SD-07 Certificates

Volatile Organic Compound (VOC)

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

Submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of chemicals.

1.4.2 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.4.3 Maintenance of Traffic

1.4.3.1 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.5 DELIVERY, STORAGE, AND HANDLING

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.6 ENVIRONMENTAL REQUIREMENTS

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 40 degrees F and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

PART 2 PRODUCTS

2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, parking areas, and streets shall conform to FS TT-P-1952, color as indicated.

Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.2 THERMOPLASTIC COMPOUNDS

2.2.1 Asphalt Concrete Primer

The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic compound (VOC). Submit certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located. Solids content shall not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch plus or minus 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.

2.2.2 Portland Cement Concrete Primer

The primer for Portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition. Epoxy primers recommended by the manufacturer shall be approved by the Contracting Officer prior to use. Requests for approval shall be accompanied with technical data, instructions for use, and a 1 quart sample of the primer material.

2.3 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Submit certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers in the presence of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Thoroughly clean surfaces to be marked before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with

several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.1.1 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Remove existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. New preformed and thermoplastic pavement markings shall not be applied over existing preformed or thermoplastic markings. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified. Provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Rate of Application

a. Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 plus or minus 5 square feet/gallon.

3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.2.2 Thermoplastic Compounds

3.2.2.1 Longitudinal Markings

All centerline, skipline, edgeline, and other longitudinal type markings shall be applied with a mobile applicator. All special markings, crosswalks, stop bars, legends, arrows, and similar patterns shall be placed with a portable applicator, using the extrusion method.

3.2.2.2 Primer

After surface preparation has been completed the asphalt and/or concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

a. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch (265-400 square feet/gallon).

3.2.2.3 Markings

After the primer has "set-up," the thermoplastic shall be applied at temperatures no lower than 375 degrees F nor higher than 425 degrees F at the point of deposition. Immediately after installation of the marking, drop-on glass spheres shall be mechanically applied so that the spheres are held by and imbedded in the surface of the molten material.

a. Sprayed Markings: All sprayed thermoplastic markings shall be applied at the specified width and the thicknesses designated in the contract plans. If the plans do not specify a thickness, centerline markings shall be applied at a wet thickness of 0.090 inch, plus or minus 0.005 inch, and edgeline markings at a wet thickness of 0.060 inch plus or minus 0.005 inch.

3.3 MARKING REMOVAL

Pavement marking, including plastic tape, shall be removed in the areas shown on the drawings. Removal of marking shall be as complete as possible without damage to the surface. Aggregate shall not be exposed by the removal process. After the markings are removed, the cleaned pavement surfaces shall exhibit adequate texture for remarking as specified in paragraph SURFACE PREPARATION. Demonstrate removal of pavement marking in an area designated by the Contracting Officer. The demonstration area will become the standard for the remainder of the work.

3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

-- End of Section --

SECTION 32 93 00

EXTERIOR PLANTS
02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICANHORT (AH)

ANSI/ANLA Z60.1	(2004) American Standard for Nursery Stock

ASTM INTERNATIONAL (ASTM)

ASTM A580/A580M	(2015) Standard Specification for Stainless Steel Wire
ASTM C602	(2013a) Agricultural Liming Materials
ASTM D4427	(2013) Peat Samples by Laboratory Testing
ASTM D4972	(2013) pH of Soils
ASTM D5268	(2013) Topsoil Used for Landscaping Purposes
ASTM D5539	(2013) Seed Starter Mix

L.H. BAILEY HORTORIUM (LHBH)

LHBH	(1976) Hortus Third

TREE CARE INDUSTRY ASSOCIATION (TCIA)

TCIA A300P1	(2008) ANSI A300 Part1: Tree Care Operations - Trees, Shrubs and Other Woody Plant Maintenance Standard Practices - Pruning
TCIA Z133.1	(2006) American National Standard for Arboricultural Operations - Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush - Safety Requirements

U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

State Landscape Contractor's License

Time Restrictions and Planting Conditions

Indicate anticipated dates and locations for each type of planting.

SD-03 Product Data

Local/Regional Materials; (LEED NC)

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Peat

Composted Derivatives

Rotted Manure

Organic Mulch Materials

Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

Gypsum; (LEED NC)

Drainage Pipe; (LEED NC)

Mulch; G

Ground Stakes

Hose; (LEED NC)

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar

value of products included in project.

Fertilizer

Weed control fabric; G

Staking Material

Ground Stakes

Metal anchors

Antidesiccants

Erosion control materials

Photographs; G

SD-04 Samples

Mulch; G

Submit one pint of mulch.

SD-06 Test Reports

Topsoil composition tests

SD-07 Certificates

Forest Stewardship Council (FSC) Certification; (LEED NC)

Nursery certifications

Indicate names of plants in accordance with the LHBH, including type, quality, and size.

SD-10 Operation and Maintenance Data

Plastic Identification

When not labeled, identify types in Operation and Maintenance Manual.

1.3 QUALITY ASSURANCE

1.3.1 Topsoil Composition Tests

Commercial test from an independent testing laboratory including basic soil groups (moisture and saturation percentages, Nitrogen-Phosphorus-Potassium (N-P-K) ratio, pH (ASTM D4972), soil salinity), secondary nutrient groups (calcium, magnesium, sodium, Sodium Absorption Ratio (SAR)), micronutrients (zinc, manganese, iron, copper), toxic soil elements (boron, chloride, sulfate), cation exchange and base saturation percentages, and soil amendment and fertilizer recommendations with quantities for plant material being transplanted. Soil required for each test shall include a maximum depth of 18 inches of approximately 1 quart volume for each test. Areas sampled should not be larger than 1 acre and should contain at least 6-8 cores for each sample area and be

thoroughly mixed. Problem areas should be sampled separately and compared with samples taken from adjacent non-problem areas. The location of the sample areas should be noted and marked on a parcel or planting map for future reference.

1.3.2 Nursery Certifications

a. Indicate on nursery letterhead the name of plants, including botanical common names, quality, and size.

b. Inspection certificate.

c. Mycorrhizal fungi inoculum for plant material treated

1.3.3 State Landscape Contractor's License

Construction company shall hold a landscape contractors license in the state where the work is performed and have a minimum of five years landscape construction experience. Submit copy of license and three references for similar work completed in the last five years.

1.3.4 Plant Material Photographs

Contractor shall submit nursery photographs, for government approval prior to ordering, for each tree larger than 24-inch box/ 2-inch caliper size.

1.3.5 Pre-Installation Meeting

Convene a pre-installation meeting a minimum of one week prior to commencing work of this section. Require attendance of parties directly affecting work of this section. Review conditions of operations, procedures and coordination with related work. Agenda shall include the following:

a. Tour, inspect, and discuss conditions of planting materials.

b. Review planting schedule and maintenance.

c. Review required inspections.

d. Review environmental procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Branched Plant Delivery

Deliver with branches tied and exposed branches covered with material which allows air circulation. Prevent damage to branches, trunks, root systems, and root balls and desiccation of leaves.

1.4.1.2 Soil Amendment Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and federal laws. Store in dry locations away from contaminates.

1.4.1.3 Plant Labels

Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct botanical and common plant name and variety as applicable and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels shall be legible for a minimum of 60 days after delivery to the planting site.

1.4.2 Storage

1.4.2.1 Plant Storage and Protection

Store and protect plants not planted on the day of arrival at the site as follows:

a. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.

b. Protect balled and burlapped plants from freezing or drying out by covering the balls or roots with moist burlap, sawdust, wood chips, shredded bark, peat moss, or other approved material. Provide covering which allows air circulation.

c. Keep plants in a moist condition until planted by watering with a fine mist spray.

d. Do not store plant material directly on concrete or bituminous surfaces.

1.4.2.2 Fertilizer and Mulch Storage

Store in dry locations away from contaminants.

1.4.2.3 Topsoil

Prior to stockpiling topsoil, eradicate on site undesirable growing vegetation. Clear and grub existing vegetation three to four weeks prior to stockpiling existing topsoil.

1.4.2.4 Weed Control Fabric

Store materials on site in enclosures or under protective covering in dry location. Store under cover out of direct sunlight. Do not store materials directly on ground.

1.4.3 Handling

Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Handle balled and burlapped plants carefully to avoid damaging or breaking the earth ball or root structure. Do not handle plants by the trunk or stem. Remove damaged plants from the site.

1.4.4 TIME LIMITATION

Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum of 90 days. The time limitation between installing the plant material and placing the

mulch shall be a maximum of 24 hours.

1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

Coordinate installation of planting materials during optimal planting seasons for each type of plant material required.

1.5.1 Planting Dates

Plant all plants from 3/30 to 6/15 and 9/15 to 11/1.

1.5.2 Restrictions

Do not plant when ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.6 GUARANTEE

All plants shall be guaranteed for one year beginning on the date of inspection by the Contracting Officer to commence the plant establishment period, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by the Government or by weather conditions unusual for the warranty period. Transplanted plants require no guarantee.

Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season. At end of warranty period, replace planting materials that die or have 25 percent or more of their branches that die during the construction operations or the guarantee period.

PART 2 PRODUCTS

2.1 PLANTS

2.1.1 Regulations and Varieties

Existing trees and shrubs to remain shall be protected and a planting plan be arranged around them. Furnish nursery stock in accordance with ANSI/ANLA Z60.1, except as otherwise specified or indicated. Each plant or group of planting shall have a "key" number indicated on the nursery certifications of the plant schedule. Furnish plants, including turf grass, grown under climatic conditions similar to those in the locality of the project. Plants specified shall be indigenous, low maintenance varieties, tolerant of site's existing soils and climate without supplemental irrigation or fertilization once established. Spray plants budding into leaf or having soft growth with an antidesiccant before digging. Plants of the same specified size shall be of uniform size and character of growth. Plants shall be chosen with their mature size and growth habit in mind to avoid over-planting and conflict with other plants, structures or underground utility lines. All plants shall comply with all Federal and State Laws requiring inspection for plant diseases and infestation.

2.1.2 Shape and Condition

Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and undamaged root system.

2.1.2.1 Deciduous Trees

Symmetrically developed and of uniform habit of growth, with straight boles or stems, and free from objectionable disfigurements.

2.1.2.2 Evergreen Trees

Well developed symmetrical tops with typical spread of branches for each particular species or variety.

2.1.3 Plant Size

Minimum sizes measured after pruning and with branches in normal position, shall conform to measurements indicated, based on the average width or height of the plant for the species as specified in ANSI/ANLA Z60.1. Plants larger in size than specified may be provided with approval of the Contracting Officer. When larger plants are provided, increase the ball of earth or spread of roots in accordance with ANSI/ANLA Z60.1.

2.1.4 Root Ball Size

All box-grown, field potted, field boxed, collected, plantation grown, bare root, balled and burlapped, container grown, processed-balled, and in-ground fabric bag-grown root balls shall conform to ANSI/ANLA Z60.1. All wrappings and ties shall be biodegradable. Root growth in container grown plants shall be sufficient to hold earth intact when removed from containers. Root bound plants will not be accepted.

2.1.4.1 Mycorrhizal fungi inoculum

Before shipment, root systems shall contain mycorrhizal fungi inoculum.

2.1.5 Growth of Trunk and Crown

2.1.5.1 Deciduous Trees

A height to caliper relationship shall be provided in accordance with ANSI/ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there shall be no division of the trunk which branches more than 6 inches from ground level.

2.1.5.2 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. The coniferous evergreen trees shall not be "poled" or the leader removed. Acceptable plant material shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

2.1.5.3 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material shall have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. Acceptable plant material shall be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

2.2 TOPSOIL

2.2.1 Existing Soil

Modify to conform to requirements specified in paragraph entitled "Composition."

2.2.2 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available topsoil shall be existing surface soil stripped and stockpiled on-site.

2.2.3 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

2.2.4 Composition

Evaluate soil for use as topsoil in accordance with ASTM D5268. From 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D4972. Topsoil shall be free of sticks, stones, roots, plants, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	7 to 17 percent
Clay	4 to 12 percent
Sand	70 to 82 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.3 SOIL CONDITIONERS

Provide singly or in combination as required to meet specified requirements for topsoil. Soil conditioners shall be nontoxic to plants.

2.3.1 Lime

Commercial grade hydrated limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than 80 percent.

2.3.2 Aluminum Sulfate

Commercial grade.

2.3.3 Sulfur

100 percent elemental

2.3.4 Iron

100 percent elemental

2.3.5 Peat

Natural product of peat moss derived from a freshwater site and conforming to ASTM D4427 or ASTM D5539 as modified herein. Shred and granulate peat to pass a 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation. Biobased content shall be a minimum of 100 percent. Peat shall not contain invasive species, including seeds.

2.3.6 Sand

Clean and free of materials harmful to plants.

2.3.7 Perlite

Horticultural grade.

2.3.8 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, invasive species, including seeds, and soil stabilized with nitrogen and having the following properties:

2.3.8.1 Particle Size

Minimum percent by weight passing:

No. 4 mesh screen	95
No. 8 mesh screen	80

2.3.8.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.8.3 Biobased Content

Minimum 100 percent.

2.3.9 Gypsum

Coarsely ground gypsum from recycled scrap gypsum board comprised of calcium sulfate dihydrate 91 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 20 mesh screen, 100 percent passing thru 16 mesh screen.

2.3.10 Vermiculite

Horticultural grade for planters.

2.3.11 Rotted Manure

Well rotted horse or cattle manure containing maximum 25 percent by volume of straw, sawdust, or other bedding materials; free of seeds, stones, sticks, soil, and other invasive species.

2.4 PLANTING SOIL MIXTURES

Three parts topsoil, one part clean sand, and one part humus. Thoroughly mix all parts of planting soil mixture to a uniform blend throughout.

2.5 FERTILIZER

Fertilizer for groundcover, wildflowers and grasses is not permitted. Fertilizer for trees, plants, and shrubs shall be as recommended by plant supplier, except synthetic chemical fertilizers are not permitted. Fertilizers containing petrochemical additives or that have been treated with pesticides or herbicides are not permitted.

2.5.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

20 percent available nitrogen
10 percent available phosphorus
5 percent available potassium

2.5.2 Fertilizer Tablets

Organic, plant tablets composed of tightly compressed fertilizer chips forming a tablet that is insoluble in water, is designed to provide a continuous release of nutrients for at least 24 months and contains the following minimum percentages, by weight, of plant food nutrients:

20 percent available nitrogen
10 percent available phosphorus
5 percent available potassium

2.6 MULCH

Free from noxious weeds, mold, pesticides, or other deleterious materials.

2.6.1 Organic Mulch Materials

Wood cellulose fiber wood chips ground or shredded bark shredded hardwood pine straw mulch from site when available. Biobased content shall be a minimum of 100 percent. Wood cellulose fiber shall be processed to contain no growth or germination-inhibiting factors, dyed with non-toxic, biodegradable dye to an appropriate color to facilitate visual metering of materials application. Paper-based hydraulic mulch shall contain a minimum of 100 percent post-consumer recycled content. Wood-based hydraulic mulch shall contain a minimum of 100 percent recycled material.

2.7 STAKING AND GUYING MATERIAL

2.7.1 Staking Material

2.7.1.1 Tree Support Stakes

Rough sawn hard wood free of knots, rot, cross grain, bark, long slivers, or other defects that impair strength. Stakes shall be minimum 2 inches square or 2-1/2 inch diameter by 8 feet long, pointed at one end.

2.7.2 Guying Material

2.7.2.1 Guying Wire

12 gauge annealed galvanized steel, ASTM A580/A580M.

2.7.2.2 Guying Cable

Minimum five-strand, 3/16 inch diameter galvanized steel cable.

2.7.3 Hose Chafing Guards

New or used 2 ply 3/4 inch diameter reinforced rubber or plastic hose, black or dark green, all of same color.

2.7.4 Flags

White surveyor's plastic tape, 12 inches long, fastened to guying wires or cables.

2.7.5 Turnbuckles

Galvanized or cadmium-plated steel with minimum 3 inch long openings fitted with screw eyes. Eye bolts shall be galvanized or cadmium-plated steel with one inch diameter eyes and screw length 1-1/2 inches, minimum.

2.7.6 Deadmen

4 by 8 inch rectangular or 8 inch diameter by36 inch long, pine wood material.

2.7.7 Metal Anchors

2.7.7.1 Driven Anchors

Malleable iron, arrow shaped, galvanized, sized as follows:

Tree Caliper	Anchor Size
2 inches and under	3 inches
3 to 6 inches	4 inches
6 to 8 inches	6 inches

Tree Caliper	Anchor Size
8 to 10 inches	8 inches
10 to 12 inches	10 inches

2.7.7.2 Screw Anchors

Steel, screw type with welded-on 3 inch round helical steel plate, minimum 3/8 inch diameter, 15 inches long.

2.8 ANTIDESICCANTS

Sprayable, water insoluble vinyl-vinledine complex which produce a moisture retarding barrier not removable by rain or snow. Film shall form at temperatures commonly encountered out of doors during planting season and have a moisture vapor transmission rate (MVT) of the resultant film of maximum 10 grams per 24 hours at 70 percent humidity.

2.9 EROSION CONTROL MATERIALS

Erosion control material shall conform to the following:

2.9.1 Erosion Control Blanket

100 percent agricultural straw stitched with a degradable nettings, designed to degrade within 12 months.

2.9.2 Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.9.3 Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

2.9.4 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

2.10 ROOT CONTROL BARRIER

Flexible and permeable geotextile fabric with permanently attached time-released nodules. Color to be black. Pre-formed, round, tapered cylinder barrier with integral vertical root deflecting ribs constructed of ultraviolet resistant polypropylene material. Color to be black.

2.11 WATER

Source of water to be approved by Contracting Officer and suitable quality for irrigation and shall not contain elements toxic to plant life, including acids, alkalis, salts, chemical pollutants, and organic matter. Use collected storm water or graywater when available.

2.12 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

2.13 SOURCE QUALITY CONTROL

The Contracting Officer will inspect plant materials at the project site and approve them. Tag plant materials for size and quality.

PART 3 EXECUTION

3.1 EXTENT OF WORK

Provide soil preparation, fertilizing, tree, and planting, edging, staking and guying, weed control fabric, erosion control material and root control barrier installation of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.2 ALTERNATIVE HERBICIDE TREATMENT (SOLARIZING SOIL)

Within 48 hours of subsoil preparation, saturate soil with water to a depth of 3 feet. Immediately stake polyethylene sheeting over area to be planted. Stake tightly to surface of soil. Maintain sheeting in place for a minimum of 6 weeks. Immediately after removing sheeting, cover area to be planted with topsoil. Do not till soil prior to applying topsoil.

3.3 PREPARATION

3.3.1 Protection

Protect existing and proposed landscape features, elements, and sites from damage or contamination. Protect trees, vegetation, and other designated features by erecting high-visibility, reusable construction fencing. Locate fence no closer to trees than the drip line. Plan equipment and vehicle access to minimize and confine soil disturbance and compaction to areas indicated on Drawings.

3.3.2 Layout

Stake out approved plant material locations and planter bed outlines on the project site before digging plant pits or beds. The Contracting Officer reserves the right to adjust plant material locations to meet field conditions. Do not plant closer than 36 inches to a building wall, pavement edge, fence or wall edge and other similar structures. Provide on-site locations for excavated rock, soil, and vegetation.

3.3.3 Erosion Control

Provide erosion control and seeding with native plant species to protect slopes.

3.3.4 Soil Preparation

3.3.4.1 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site.

3.3.4.2 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site.

3.4 PLANT BED PREPARATION

Verify location of underground utilities prior to excavation. Protect existing adjacent turf before excavations are made. Do not disturb topsoil and vegetation in areas outside those indicated on Drawings. Where planting beds occur in existing turf areas, remove turf to a depth that will ensure removal of entire root system. Measure depth of plant pits from finished grade. Depth of plant pit excavation shall be as indicated and provide proper relation between top of root ball and finished grade. Install plant material as specified in paragraph entitled "Plant Installation." Do not install trees within 10 feet of any utility lines or building walls.

3.5 PLANT INSTALLATION

3.5.1 Individual Plant Pit Excavation

Excavate pits at least twice as large in diameter as the size of ball or container to depth shown.

3.5.2 Plant Beds with Multiple Plants

Excavate plant beds continuously throughout entire bed as outlined to depth shown.

3.5.3 Handling and Setting

Move plant materials only by supporting the container. Set plants on hand compacted layer of prepared backfill soil mixture 6 inches thick and hold plumb in the center of the pit until soil has been tamped firmly around root ball. Set plant materials, in relation to surrounding finish grade depth at which they were grown in the nursery, collecting field or container. Replace plant material whose root balls are cracked or damaged either before or during the planting process.

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas.

3.5.3.1 Balled and Burlapped Stock

Backfill with topsoil to approximately half the depth of ball and then tamp and water. Carefully remove or fold back excess burlap and tying materials from the top a minimum 1/3 depth from the top of the rootball. Tamp and complete backfill, place mulch topdressing, and water. Remove wires and non-biodegradable materials from plant pit prior to backfill operations.

3.5.4 Earth Mounded Watering Basin for Individual Plant Pits

Form with topsoil around each plant by replacing a mound of topsoil around the edge of each plant pit. Watering basins shall be 6 inches deep for

trees and 4 inches deep for shrubs. Eliminate basins around plants in plant beds containing multiple plants.

Form with topsoil around each plant by placing a mound of topsoil around the edge of each plant pit. Watering basins shall be 6 inches deep for trees and 4 inches deep for shrubs. Construct watering basin in a 4-1/2 foot diameter circle around specimen (not planted in a close group) trees and shrubs.

3.5.5 Weed Control Fabric Installation

Remove grass and weed vegetation, including roots, from within the area enclosed by edging. Completely cover areas enclosed by edging with specified weed control fabric prior to placing mulch layer. Overlap cut edges 6 inches.

3.5.6 Erosion Control Material

Install in accordance with manufacturer's instructions.

3.5.7 Placement of Mulch Topdressing

Place specified mulch topdressing on top of weed control fabric covering total area enclosed by edging. Place mulch topdressing to a depth of 3 inches.

3.5.8 Mulch Topdressing

Provide mulch topdressing over entire planter bed surfaces and individual plant surfaces including earth mound watering basin around plants to a depth of 3 inches after completion of plant installation and before watering. Keep mulch out of the crowns of shrubs. Place mulch a minimum 2 to 3 inches away from trunk of shrub or tree. Place on top of any weed control fabric.

3.5.9 Fertilization

3.5.9.1 Fertilizer Tablets

Place fertilizer planting tablets evenly spaced around the plant pits to the manufacturer's recommended depth.

3.5.9.2 Granular Fertilizer

Apply granular fertilizer as a top coat prior to placing mulch layer and water thoroughly.

3.5.10 Watering

Start watering areas planted as required by temperature and wind conditions. Slow deep watering shall be used. Apply water at a rate sufficient to ensure thorough wetting of soil to a depth of 12 inches without run off or puddling. Watering of other plant material or adjacent areas shall be prevented.

3.5.11 Staking and Guying

3.5.11.1 Staking

Stake plants with the number of stakes indicated complete with double strand of 12 gage guy wire as detailed. Attach guy wire half the tree height but not more than 5 feet high. Drive stakes to a depth of 2-1/2 to 3 feet into the ground outside the plant pit. Do not injure the root ball.

3.5.11.2 Guying

Guy plants as indicated. Attach two strands of guying wire around the tree trunk at an angle of 45 degrees at approximately 1/2 of the trunk height. Protect tree trunks with chafing guards where guying wire contacts the tree trunk. Anchor guys to deadmen wood blocks or wood ground stakes. Fasten flags to each guying wire approximately 2/3 of the distance up from ground level.

3.5.11.3 Chafing Guards

Use hose chafing guards, as specified where guy wire will contact the plant.

3.5.11.4 Deadmen

Place deadmen minimum 18 inches below ground surface. Place equal distance from tree trunk and around the plant pit.

3.5.11.5 Wood Ground Stakes

Drive wood ground stakes into firm ground outside of plant pit with top of stake flush with ground. Place equal distance from tree trunk and around the plant pit.

3.5.11.6 Flags

Securely fasten flags on each guy wire and cable approximately two-thirds of the distance up from ground level.

3.5.12 Pruning

Prune in accordance with safety requirement of TCIA Z133.1.

3.5.12.1 Trees and Shrubs

Remove dead and broken branches. Prune to correct structural defects only. Retain typical growth shape of individual plants with as much height and spread as practical. Do not cut central leader on trees. Make cuts with sharp instruments. Do not flush cut with trunk or adjacent branches. Collars shall remain in place. Pruning shall be accomplished by trained and experienced personnel and shall be accordance with TCIA A300P1.

3.5.12.2 Wound Dressing

Do not apply tree wound dressing to cuts.

3.6 RESTORATION AND CLEAN UP

3.6.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.6.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite at an approved landfill, recycling center, or composting center. Separate and recycle or reuse the following landscape waste materials: nylon straps, wire, ball wrap, burlap, wood stakes. Adjacent paved areas shall be cleared.

-- End of Section --

HAZARDOUS MATERIALS REPORT
FOR
NAVAL STATION NEWPORT
BUILDING 678

PREPARED FOR:

BURNS & MCDONNELL
1305 EXECUTIVE BOULEVARD, SUITE 160
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PREPARED BY:

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USAEMI PROJECT NO. 15-020670-01

REPORT DATE: NOVEMBER 12, 2015

USA Environmental Management, Inc.
Environmental Engineering Construction

TABLE OF CONTENTS

1.0 INTRODUCTION 2
2.0 SURVEY FOR ASBESTOS-CONTAINING MATERIALS 2
2.1 Asbestos History 2
2.2 Asbestos Inspection 3
2.3 Asbestos Summary 4
2.4 Asbestos Assessment Disclaimer 6
2.5 Asbestos Recommendations 6
2.6 Asbestos Certification 7
3.0 OTHER HAZARDS 7
3.1 H&S Report Summarized 7
3.2 Microbial Assessment 9

APPENDICIES

APPENDIX A

- Asbestos Sample Certificates of Analysis & Chain of Custody Records
- Asbestos Bulk Sample Locations/Plans
- Inspector Certification
- Laboratory Certification

APPENDIX B

- H&S Environmental, Inc. – Hazardous Building Materials Survey

1.0 INTRODUCTION

USA Environmental Management, Inc., (USAEMI) was contracted by Burns & McDonnell (BM), to conduct a limited/follow-up environmental assessment of Building 678 at Naval Station Newport, in Newport, Rhode Island. The purpose of the inspection was to determine the environmental conditions of the building, in preparation for the upcoming renovations.

The limited/follow-up environmental assessment for hazardous materials was conducted during October 2015, by William Weisgarber, Jr., Wayne K. Martin and Richard J. Reynolds. All inspectors are certified United States Environmental Protection Agency (USEPA), Asbestos Hazard Emergency Response Act (AHERA) Asbestos Building Inspectors, with significant experience in asbestos-containing material (ACM) surveys, hazardous materials surveys and remediation project design. In addition, Mr. Weisgarber is a Rhode Island Department of health Asbestos Inspector.

Copies of all applicable Certifications and Licensure are included in this report.

2.0 SURVEY FOR ASBESTOS-CONTAINING MATERIALS

2.1 Asbestos History

During the last few decades the medical evidence has continued to mount regarding the importance of environmental factors as a source of carcinogenicity. Asbestos is regulated by the Occupational Safety and Health Administration, cited by the National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the National Toxicology Program, and the Carcinogens Assessment Group of the U.S. Environmental Protection Agency (USEPA).

As a result of the pervasive use of this material, asbestos has become a widespread environmental contaminant for large segments of our society and has been conclusively demonstrated to cause fibrosis and malignancies of the lung and other organs. The majority of the evidence comes from industrial exposure to this material, whereas exposures were more intense and for a greater period of time. However, there is also evidence that low exposures to asbestos fibers may also have carcinogenic potential.

Asbestos fibers resist degradation and persist in the environment because of the fibers particular structure. They possess aerodynamic capabilities for prolonged suspension and repeated cycles of re-entrainment. Asbestos fibers find entry into the body by inhalation and through ingestion. The retained fibers are found in tissues throughout the lifetime of the exposed person - long after cessation of exposure. It has been demonstrated that asbestos fibers can migrate to other organs. Malignancies related to inhalation and ingestion include cancer of the lungs, mesothelioma of the pleura and peritoneum (lining of the lung and abdominal region), and neoplasms of other sites.

The degree and duration of exposure to develop an asbestos related health disorder is unknown at this time. However, a report to the U.S. Consumer Products Safety Commission by the Chronic Hazard Advisory Panel on Asbestos reports:

From a public health standpoint, and in the absence of final clarifications of the uncertainties, it is prudent to behave as if asbestos fibers may be carcinogenic at low level exposure and at small particle sizes.

As a result, the Asbestos Hazard Emergency Response Act (AHERA, 40 CFR Part 763) was enacted. An AHERA inspection requires an accredited inspector to visually inspect and assess the condition of all known or assumed friable asbestos-containing materials (ACM); to visually inspect non-friable ACM and touch it to determine friability; and to identify homogeneous areas of friable materials. The National Emission Standard for Hazardous Air Pollutants (NESHAPs) requires thorough inspections for ACM in structures before renovation or demolition.

2.2 Asbestos Inspection

Prior to the inspection, an audit was conducted in an effort to determine past survey findings and bulk sampling results that were performed by other consultants. USAEMI was provided with the Hazardous Building Materials Survey Report for Building #678 prepared by H&S Environmental, Inc., (H&S) dated September 2011. Relevant documents discovered/provided are included in the appendices of this report.

This inspection for ACM was limited in scope to include; roofing materials, as well as non-friable organically bound materials which tested negative for asbestos by H&S. The scope was expanded to include interior suspect materials not previously tested by H&S which may be impacted during the renovations. USAEMI survey was conducted in all accessible interior and exterior spaces. Wherever possible, the attempt was made to determine the presence of hidden materials. However, no destructive demolition activities were performed during the course of the assessment.

USAEMI collected the necessary number of bulk samples to properly identify ACM and recorded each sample location on the building's plan. All samples collected were in accordance with 40 CFR, Part 763, the USEPA's, AHERA protocol. Sampling was performed utilizing wet methods. Equipment used during the survey was decontaminated at the completion of extracting each sample, eliminating the potential for any cross contamination of samples. In addition, all samples were given a homogeneous area sampling identification number.

Bulk samples of roofing materials and suspect materials not previously tested were analyzed in accordance with the USEPA's 40 CFR, Part 763, Polarized Light Microscopy (PLM) analytical protocol. In addition to the PLM analytical protocol, the USEPA recommends Transmission Electron Microscopy (TEM) analysis for non-friable organically bound materials (NOB) where "none detected" or less than 1% asbestos results were reported via PLM. USAEMI analyzed all samples per USEPA's recommendations.

The sample identification system of this report consists of a three-unit sample identification number. The first set of text indicates the sample number, the next set indicates the inspector's initials and the last six (6) digits indicate the sampling date. These sample numbers match the chain-of-custody, lab reports of analysis, and sample identification numbers on the drawings.

Sample result summaries are provided in table format. The first column indicates the homogenous area identification number (ID No.); the second column is the material description; and the third column indicates the asbestos content, type of asbestos or if the material was none detected for asbestos. Sampled materials that contain asbestos and/or were assumed to contain asbestos are indicated in **bold**.

ACM CATEGORY (NESHAPs)

Categories	Typical Material Type	Guidance for RACM
Friable ACM	Pipe insulation and pipe-fittings	Able to crush with hand pressure
Category I, Non-friable	Floor covering products, Gaskets, Roofing cements	Non-friable made friable due to sanding, grinding, cutting or abrading
Category II, Non-friable	Cement board products, floor tile, etc., that is significantly damaged.	Non-friable material becoming friable or is expected to become friable from the act of renovation or demolition

Any ACM that is Friable, or Category I and II Non-friable that meets the qualifications to be considered a Regulated Asbestos-Containing Material (RACM), must be removed prior to demolition that would break up, dislodge, or similarly disturb the material or preclude access to the material for subsequent removal. This includes gasket materials.

2.3 Asbestos Summary

A previous inspection report, for Building 678, prepared by H&S Environmental, Inc., (H&S) dated September 2011 including hazardous material survey data was provided. The previous inspection report indicated seventeen (17) homogenous materials identified and sampled. Materials identified were sampled in sufficient quantity per the AHERA regulations for PLM.

USAEMI's asbestos survey sampled non-friable organically bound materials identified in the H&S report. USAEMI's sampled materials were analyzed TEM NOB for confirmation. H&S homogenous materials identified include:

TABLE 1 – H&S ASBESTOS SAMPLING RESULTS		
Material	**H&S Results**	**NOB Material**
Exterior Damp-Proofing Material	**10% Chrysotile**	**Yes**

TABLE 1 – H&S ASBESTOS SAMPLING RESULTS		
Material	**H&S Results**	**NOB Material**
Exterior Finish Insulation System (EFIS)	None Detected	No
EFIS Adhesive	None Detected	No
Caulking (EFIS to Concrete)	None Detected	Yes
Original Caulking (Brick to EFIS)	None Detected	Yes
Original Window Caulking	None Detected	Yes
Caulking (Brick to Concrete)	None Detected	Yes
Speckled Sheet Flooring & Associated Adhesive	None Detected	Yes
Fire Stop Putty (Red)	None Detected	Yes
2'x2' Ceiling Tile	None Detected	No
Air Duct Seam Sealant	None Detected	Yes
Joint Compound	None Detected	No
2'x2' Ceiling Tile (Plaster)	None Detected	No
12"x12" Floor Tile and Associated Mastic	None Detected	Yes
Cove Base Adhesive	None Detected	Yes
Carpet Mastic	None Detected	Yes
End Cap Paint on Fiberglass Insulation	None Detected	Yes

During the course of the assessment, USAEMI noted a total of twenty-eight (28) suspect materials identified during the site visit. Fourteen (14) of the suspect materials were unique homogenous materials to the H&S report. Suspect materials identified were sampled in sufficient quantity as mandated by 40 CFR, Part 763.87(a). Of the materials sampled, **one (1)** tested positive for asbestos (greater than one (1) percent by weight) and **one (1)** was previously determined to contain asbestos. Materials sampled for asbestos content and/or assumed asbestos-containing materials are listed below.

TABLE 2 – BUILDING 678		
ID No.	**Material Description**	**Asbestos Content**
01	White Sealant at Metal Curb Flashing Seams	None Detected
02	**Black Tar Flashing at Roof Vents**	**8% Chrysotile**
03	Black Rubberized Tar Sealant at Rolled Roof Seams	None Detected
04	Black Tar/Felt Roofing/Vapor Barrier	<.1% Chrysotile
05	White Cementitious Roof Deck	None Detected
06	Grey Adhesive Associated with Exterior Façade Insulating System (EFIS)	None Detected
07	Yellow Caulk at Interface of EFIS & Concrete	None Detected
08	Grey/Clear Caulk at Interface of EFIS & Concrete	None Detected
09	Grey Caulk at Interface of Brick & Concrete	None Detected
10	Black Sealant at Interface of Concrete Lintel & Brick	None Detected
11	White Sealant at Duct Seams	None Detected
12	Cream, Peach, Grey Speckled Sheet Flooring	None Detected
13	Yellow Adhesive Associated with ID No. 12	None Detected
14	Yellow Pipe Dope Association with Red Fire Suppression System	None Detected

TABLE 2 – BUILDING 678		
ID No.	**Material Description**	**Asbestos Content**
15	Grey Sealant at Metal Duct Seams	None Detected
16	4" Tan Cove Base	None Detected
17	White Adhesive Associated with ID No. 16	None Detected
18	Red Fire Stop at Wall Penetrations	None Detected
19	Yellow Pipe Dope Associated with Condensation Lines	None Detected
20	Mauve Stair Tread with Cream & Grey Specks	None Detected
21	Yellow Adhesive Associated with ID No. 20	<0.25% Chrysotile
22	Brown Stair Tread	None Detected
23	White Adhesive Associated with ID No. 22	None Detected
24	1'x1' Pink Mottled Pattern Floor Tile	None Detected
25	Black Mastic Associated with ID No. 24	None Detected
26	Yellow Carpet Adhesive	None Detected
27	White Sealant at Exposed Ends of Fiberglass Pipe Insulation	None Detected
28	**Exterior Damp-Proofing Material**	**10% Chrysotile***

Note: *Sampling results from H&S reporting

2.4 Asbestos Assessment Disclaimer

The Client should be aware that this survey incorporated limited destructive sampling to access hidden or obscured asbestos-containing materials (ACM). However, non-observable asbestos-containing materials may exist in such areas as insulated piping lines in wall cavities, ACM on pipes buried in concrete slabs, vapor barrier on exterior below grade walls and other potential ACM which is inaccessible for sample extraction due to the physical coverage of the material. Due diligence was observed in performing sampling by generally recognized industry sampling practices.

2.5 Asbestos Recommendations

The following general recommendations are provided to assist in the renovation and localized demolition of the existing structures with ACM. Note that any building material that is not identified as homogenous with those addressed in this report must be considered as ACM unless additional testing indicates otherwise. Locations of samples are indicated on the inspection drawings.

The following work practices should be followed whenever activities involving any ACM occur at this Facility.

- Ensure any ACM is managed in accordance with Federal, State and Local regulations.
- Remove any ACM that maybe disturbed during renovations or ensure the materials will not be disturbed.

- Always keep any ACM adequately wet before, during, and after removal operations.
- Conduct activities in a manner which produces no visible emissions to the outside air.
- Handle and dispose of all ACM in accordance with Federal and Naval regulations.
- Maintain this report as a component of the historical record for the buildings.

2.6 Asbestos Certification

The American Industrial Hygiene Association (AIHA) and National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory selected to analyze the bulk samples for asbestos content by PLM and TEM NOB method, equivalent to the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples' (Appendix A to Subpart F in 40 CFR Part 763) was:

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077

INTERNATIONAL ASBESTOS TESTING LABORATORY, INC.
9000 COMMERCE PARKWAY, SUITE B
MOUNT LAUREL, NJ 08054

The inspector who physically surveyed for ACM at the facility and has received EPA-approved training as an asbestos inspector is:

WILLIAM WEISGARBER, JR.
USA ENVIRONMENTAL MANAGEMENT, INC.
344 WEST STATE STREET
TRENTON, NJ 08618

SIGNATURE OF INSPECTORS: _____
William Weisgarber, Jr.

The above-signed inspector(s) certify information contained within this asbestos inspection report is true and correct concerning site conditions at the time of survey only.

3.0 OTHER HAZARDS

In addition to asbestos, other hazardous materials relevant to the project were included in the H&S building assessment and verified by USAEMI.

3.1 H&S Report Summarized

The following is an excerpt from the H&S report summarizing the findings:

Lead–Containing Paint

Testing was performed on primary coated surfaces located throughout the building. A total of one (1) bulk chip was analyzed for lead content. Results of the components indicated that the coatings contain very low concentrations of lead with results <0.011 percent by weight (% wt.).

Although the HUD (1) lead paint standard classifies lead-based paint (LBP) as that having >0.5% of lead by weight as analyzed by Atomic Absorption. For the purposes of renovation and/or demolition work, OSHA defines lead-containing paint (LCP) as any paint containing detectable amounts of lead.

The current interpretation of the EPA's Resource Conservation and Recovery Act (RCRA) requires that waste generated during projects where LCPs are present and will be disposed of is tested for the toxicity characteristic of lead in the waste stream. Toxicity Characteristic Leachate Procedure (TCLP) testing is performed to determine whether the waste (construction debris) must be classified as hazardous because of its lead content or if it can be disposed in a conventional construction and demolition (C&D) landfill. The regulatory limit for lead toxicity is 5.0 milligrams per liter (mg/L) using the EPA reference Method SW846-7420 for Atomic Absorption Spectroscopy (AAS).

Polychlorinated Biphenyls (PCBs) and DEHP

Representative fluorescent light fixtures were inspected throughout the site to determine if the ballasts contained polychlorinated biphenyls, PCBs. Additionally fluorescent light fixtures were identified and inventoried for the possible presence of di (2-ethylhexyl) phthalate (DEHP). Ballasts that do not have labels indicating the absence of PCBs should be assumed to contain PCBs. Ballasts that do not contain PCBs should be assumed to contain DEHP. All of the ballasts were observed to be undamaged and not leaking fluids.

All of the representative light fixtures that were inspected were found to have "No PCBs" labeling. As such, the ballasts should be handled as non PCB-containing. However, since the investigation involved inspecting only a representative number of ballasts, all ballasts should be checked for labeling before they are disposed of. Those, which are not labeled "No PCBs", must be removed, packaged and disposed of in accordance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal.

There are two methods currently available for disposal of PCB ballasts including incineration (recycling) and disposal. Incineration is typically more expensive but is believed to reduce the "cradle to grave liability" for the Generator. Regardless of the method, documentation of proper disposal should be provided to the Owner/Generator.

Mercury

An inventory of fluorescent light bulbs/tubes was prepared in conjunction with the investigation for PCBs. The fluorescent light bulbs located throughout the building are assumed to contain Mercury. All fluorescent light bulbs/tubes known or presumed to contain Mercury must be removed, packaged, handled, transported and disposed of in compliance with governing regulations.

Handling and disposal of all fluorescent light bulbs/lamps presumed to contain Mercury vapor should be performed in compliance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal as well as the EPA's Resource Conservation and Recovery Act (RCRA),

and other governing regulations. Specific regulations pertaining to the handling, packaging, transportation and disposal (recycling) of Mercury liquid and vapor include the EPA Regulation 40 CFR, Parts 260 through 272.

Additionally, thermostats and associated mechanical equipment were inspected for the possible presence of liquid Mercury. H&S did not observe any elemental mercury vessels in the thermostats.

Chlorofluorocarbons

H&S observed several types or pieces of equipment that contained confirmed or assumed chlorofluorocarbons, (CFCs). Please see Appendix C for specific locations and quantity. Chlorofluorocarbon removal, transportation and disposal should be performed by a qualified and experienced CFC reclamation contractor / firm in accordance with governing regulations (e.g. EPA's Clean Air Act Amendments) prior to removal and disposal of this equipment. Newer CFCs, which are unregulated as hazardous air pollutants, do not have similar removal, transport and disposal requirements.

3.2 Microbial Assessment

A limited visual inspection of the building was conducted for the presence of mold. Visual mold was observed throughout various rooms along the Southern and Eastern wall exposures.

Mold impacted spaces should be remediated in accordance with the U.S. Environmental Protection Agency's *Mold Remediation in Schools and Commercial Buildings* EPA 402-K-01-001 | September 2008.

APPENDIX A

Asbestos Sample Certificates of Analysis & Chain of Custody Records
Asbestos Bulk Sample Locations/Plans
Inspector Certification
Laboratory Certification

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID:	041533471
Customer ID:	USA53
Customer PO:	15-020670
Project ID:	Burns McDonnell

Attn:	William Weisgarber, Jr.	Phone:	(609) 656-8101
	USA Environmental Management, Inc.	Fax:	(ema) il -only
	344 West State Street	Collected:	10/26/2015
	Trenton, NJ 08618	Received:	11/09/2015
		Analyzed:	11/12/2015

Proj: Burns & McDonnell / Hazardous Materials Assessment / B678 / 15-020670 (Burns McDonnell)

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116 Method via Polarized Light Microscopy

Client Sample ID: 01BW102615 ***Lab Sample ID:*** **041533471-0001**

Sample Description: Interface of Brick Fascade And Metal Curb/White Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	White	0%	100%	None Detected	

Client Sample ID: 02BW102615 ***Lab Sample ID:*** **041533471-0002**

Sample Description: Interface of Brick Fascade And Metal Curb/White Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	White	0%	100%	None Detected	
TEM Grav. Reduction	11/12/2015	White	0.0%	100%	None Detected	

Client Sample ID: 03BW102615 ***Lab Sample ID:*** **041533471-0003**

Sample Description: Roof Vents/Black Tar Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	10%	82%	**8% Chrysotile**	

Client Sample ID: 04BW102615 ***Lab Sample ID:*** **041533471-0004**

Sample Description: Roof Vents/Black Tar Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015				Stop Positive (Not Analyzed)	

Client Sample ID: 05BW102615 ***Lab Sample ID:*** **041533471-0005**

Sample Description: Rolled Roof Seams/Black Rubberized Tar Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	5%	95%	None Detected	

Client Sample ID: 06BW102615 ***Lab Sample ID:*** **041533471-0006**

Sample Description: Rolled Roof Seams/Black Rubberized Tar Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	6%	94%	None Detected	
TEM Grav. Reduction	11/12/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 07BW102615-Tar ***Lab Sample ID:*** **041533471-0007**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	0%	100%	None Detected	

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID:	041533471
Customer ID:	USA53
Customer PO:	15-020670
Project ID:	Burns McDonnell

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116 Method via Polarized Light Microscopy

Client Sample ID: 07BW102615-Felt Roofing ***Lab Sample ID:*** **041533471-0007A**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	40%	60%	None Detected	

Client Sample ID: 07BW102615-Vapor Barrier ***Lab Sample ID:*** **041533471-0007B**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	10%	90%	None Detected	

Client Sample ID: 08BW102615-Tar ***Lab Sample ID:*** **041533471-0008**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	0%	100%	None Detected	
TEM Grav. Reduction	11/12/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 08BW102615-Felt Roofing ***Lab Sample ID:*** **041533471-0008A**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	60%	40%	None Detected	
TEM Grav. Reduction	11/12/2015	Black	0.0%	100%	**<0.1% Chrysotile**	

Client Sample ID: 08BW102615-Vapor Barrier ***Lab Sample ID:*** **041533471-0008B**

Sample Description: Black Tar / Felt Roofing Vapor Barrier

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	Black	10%	90%	None Detected	
TEM Grav. Reduction	11/12/2015				Insufficient Material	

Client Sample ID: 09BW102615 ***Lab Sample ID:*** **041533471-0009**

Sample Description: Deck/White Cementitious Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	White	0%	100%	None Detected	

Client Sample ID: 10BW102615 ***Lab Sample ID:*** **041533471-0010**

Sample Description: Deck/White Cementitious Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	11/10/2015	White	0%	100%	None Detected	

EMSL Analytical, Inc.

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Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID:	041533471
Customer ID:	USA53
Customer PO:	15-020670
Project ID:	Burns McDonnell

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116 Method via Polarized Light Microscopy

Analyst(s):

Adam Eichen	PLM (7)
Debbie Little	TEM Grav. Reduction (4)
William Bradford	PLM (6)

Reviewed and approved by:

Benjamin Ellis, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. EMSL bears no responsibility for sample collection activities or analytical method limitations. The laboratory is not responsible for the accuracy of results when requested to physically separate and analyze layered samples. PLM alone is not consistently reliable in detecting asbestos in floor coverings and similar NOBs

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036

Initial report from: 11/10/201518:57:17

OrderID: 041533471

USA Environmental Management, Inc.

344 West State Street
Trenton, New Jersey 08618

041533471

CINNAMINSON, N.J.

CLIENT: Burns & McDonnell
PROJECT: Hazardous Materials Assessment
BUILDING: B678

DATE: 10/26/2015
TECHNICIAN: 2015 NOV -9 P 3:22 B. Gerber
PROJECT #: 15-020670-

TYPE OF ANALYSIS
- [x] PLM, EPA/600/R-93/116
- [x] Stop @ 1st Positive ID No.
- [ ] PLM EPA NOB (Gravimetric)

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

SAMPLE ID	MATERIAL / (ID No.)	SAMPLE LOCATION	ADDITIONAL ANALYSIS
01 BW 102615	White Sealant at Interface of Brick Facade & Metal Curb Flashing (01)		[ ] TEM EPA NOB (if ND or <1% by PLM)
02	↓ (01)		[redacted]
03	Black Tar Flashing at Roof Vents (02)		[ ] TEM EPA NOB (if ND or <1% by PLM)
04	↓ (02)		[redacted]
05	Black Rubberized Tar Sealant at Rolled Roof Seams (03)		[ ] TEM EPA NOB (if ND or <1% by PLM)
06	↓ (03)		[redacted]
07	Black Tar/Felt Roofing/ Vapor Barrier (04)		[ ] TEM EPA NOB (if ND or <1% by PLM)
08	↓ (04)		[redacted]
09	White Cementitious Roof Deck (05)		[ ] TEM EPA NOB (if ND or <1% by PLM)
10	↓ (05)		[ ] TEM EPA NOB (if ND or <1% by PLM)
			[ ] TEM EPA NOB (if ND or <1% by PLM)
			[ ] TEM EPA NOB (if ND or <1% by PLM)

TURN-AROUND-TIME	
[ ] 3 Hours	[x] 48 Hours
[ ] 6 Hours	[ ] 3 Days
[ ] 24 Hour	[redacted] TEM, 2 Days

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
I.	10/26/15		I.	11/9/15	1000
II.			II.	11-09-15	1215
III. 11-09-15	2015		III.	11/9/15	0115

COMMENTS:

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777708A **Description / Location:** Yellow Caulk Facade South

Client No.: 12 BW 102615

Organic Fraction:	97.8 %	
Gravimetrically Reduced Subsample:	2.20 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	2.20 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

The "Gravimetrically Reduced Subsample" is the portion of the submitted sample remaining following the ashing and acid treatment processes. TEM analysis occurs on this portion of the sample. Final results are calculated to represent the sample as submitted.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government.

Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Approved By:

Frank E. Ehrenfeld, III
Laboratory Director

Date: 11/4/2015

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777709A **Description / Location:** Grey Caulk Facade East

Client No.: 12A BW 102615

Organic Fraction:	64.9 %	
Gravimetrically Reduced Subsample:	35.1 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	5.30 %	SiMg, Talc
Percent Non-Fibrous Material:	29.8 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

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This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government.

Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777709B **Description / Location:** Tan Caulk Facade East

Client No.: 12A BW 102615

Organic Fraction:	75.2 %	
Gravimetrically Reduced Subsample:	24.8 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	24.8 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

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Analysis Performed By: M. Stewart

Date: 11/4/2015

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777710A **Description / Location:** Grey Caulk Facade South

Client No.: 13 BW 102615

Organic Fraction:	97.4 %	
Gravimetrically Reduced Subsample:	2.60 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	2.60 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

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Date: 11/4/2015

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Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777711A **Description / Location:** Black Caulk Facade West

Client No.: 14 BW 102615

Organic Fraction:	99.8 %	
Gravimetrically Reduced Subsample:	0.200 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	0.200 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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Date: 11/4/2015

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Report Date: 11/4/2015
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Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777712A **Description / Location:** White Caulk 2nd Floor Laundry

Client No.: 15 BW 102615

Organic Fraction:	84.5 %	
Gravimetrically Reduced Subsample:	15.5 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	3.90 %	SiMg, Talc
Percent Non-Fibrous Material:	11.6 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777713A
Client No.: 16 BW 102615

Description / Location: Tan Vinyl Sheet Flooring 3rd Floor Room 39 Kitchen

Organic Fraction:	84.9 %	
Gravimetrically Reduced Subsample:	15.1 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	15.1 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777714A
Client No.: 16A BW 102615

Description / Location: Yellow/Grey Mastic/LvlingCmpnd 3rd Floor Room 39 Kitchen

Organic Fraction:	78.4 %	
Gravimetrically Reduced Subsample:	21.6 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	21.6 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777715A **Description / Location:** Yellow/Grey Caulk Hallway 4th Floor

Client No.: 17 BW 102615

Organic Fraction:	66.2 %	
Gravimetrically Reduced Subsample:	33.8 %	
Percent Asbestos Detected:	Trace	Chrysotile, Detected at < 0.25%
Percent Non-Asbestos Fibrous Material:	Trace	SiMg, Talc
Percent Non-Fibrous Material:	33.8 %	Other

Comments:

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Date: 11/4/2015

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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777716A
Client No.: 18 BW 102615

Description / Location: Grey Caulk Lobby 1st Floor Ent.

Organic Fraction:	55.5 %	
Gravimetrically Reduced Subsample:	44.5 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	Trace	SiAl, Other Fiber
Percent Non-Fibrous Material:	44.5 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777717A **Description / Location:** Tan Cove Base; 4" Stair 2-South

Client No.: 19 BW 102615

Organic Fraction:	99.7 %	
Gravimetrically Reduced Subsample:	0.300 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	0.300 %	Other

Comments:

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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777718A **Description / Location:** Tan Mastic Stair 2-South

Client No.: 19A BW 102615

Organic Fraction:	89.6 %	
Gravimetrically Reduced Subsample:	10.4 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	10.4 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777719A
Client No.: 20 BW 102615

Description / Location: Red Caulk At Room 53 5th Floor Hall

Organic Fraction:	64.6 %	
Gravimetrically Reduced Subsample:	35.4 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	35.4 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777720A
Client No.: 21 BW 102615

Description / Location: Tan Caulk Basement
Mech Room

Organic Fraction:	50.2 %	
Gravimetrically Reduced Subsample:	49.8 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	12.5 %	SiMg, Talc
Percent Non-Fibrous Material:	37.4 %	Other

Comments:

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Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777721A **Description / Location:** Tan Stair Tread Stair 1-North

Client No.: 22 BW 102615

Organic Fraction:	64.8 %	
Gravimetrically Reduced Subsample:	35.2 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	35.2 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777722A **Description / Location:** Yellow Mastic Stair 1-North

Client No.: 22A BW 102615

Organic Fraction:	75.4 %	
Gravimetrically Reduced Subsample:	24.6 %	
Percent Asbestos Detected:	Trace	Chrysotile, Detected at < 0.25%
Percent Non-Asbestos Fibrous Material:	Trace	SiMg, Talc
Percent Non-Fibrous Material:	24.6 %	Other

Comments: Note: Insufficient material (<100mg) to verify results.

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777723A **Description / Location:** Brown Stair Tread Stair 2-South

Client No.: 23 BW 102615

Organic Fraction:	79.8 %	
Gravimetrically Reduced Subsample:	20.2 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	20.2 %	Other

Comments:

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TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777724A **Description / Location:** White Mastic Stair 2-South

Client No.: 23A BW 102615

Organic Fraction:	99.6 %	
Gravimetrically Reduced Subsample:	0.400 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	0.400 %	Other

Comments:

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This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government.

Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777725A **Description / Location:** Pink Floor Tile 4th Floor Laundry

Client No.: 24 BW 102615

Organic Fraction:	89.7 %	
Gravimetrically Reduced Subsample:	10.3 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	10.3 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

The "Gravimetrically Reduced Subsample" is the portion of the submitted sample remaining following the ashing and acid treatment processes. TEM analysis occurs on this portion of the sample. Final results are calculated to represent the sample as submitted.

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Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

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Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777726A **Description / Location:** Black Mastic 4th Floor Laundry

Client No.: 24A BW 102615

Organic Fraction:

Gravimetrically Reduced Subsample: NA %

Percent Asbestos Detected:

Percent Non-Asbestos Fibrous Material: Insufficient Material For Analysis

Percent Non-Fibrous Material:

Comments: Note: Insufficient material provided for analysis.

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

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Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

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CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777727A **Description / Location:** Yellow/Grey Mastic/LvlingCmpnd 1st Floor Lobby

Client No.: 25 BW 102615

Organic Fraction:	68.3 %	
Gravimetrically Reduced Subsample:	31.7 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	31.7 %	Ti, Titanium Oxide Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

The "Gravimetrically Reduced Subsample" is the portion of the submitted sample remaining following the ashing and acid treatment processes. TEM analysis occurs on this portion of the sample. Final results are calculated to represent the sample as submitted.

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Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

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CERTIFICATE OF ANALYSIS

Client: USA Environmental Mgmt. Inc.
344 West State Street
Trenton NJ 08618

Report Date: 11/4/2015
Report No.: 378035
Project: Newport Naval Base B678
Project No.: 15-020670-01

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 155777728A
Client No.: 26 BW 102615

Description / Location: White/Brown Caulk/Fibrous Mech Rm Basement

Organic Fraction:	84.2 %	
Gravimetrically Reduced Subsample:	15.8 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	15.8 %	Other

Comments:

NIST-NVLAP No. 101165-0 **AIHA-LAP, LLC No. 100188** **NYS-DOH No. 11021**

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

The "Gravimetrically Reduced Subsample" is the portion of the submitted sample remaining following the ashing and acid treatment processes. TEM analysis occurs on this portion of the sample. Final results are calculated to represent the sample as submitted.

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Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: M. Stewart

Date: 11/4/2015

USA Environmental Management, Inc.

344 West State Street
Trenton, New Jersey 08618

CLIENT: Burns & McDonnell
PROJECT: Hazardous Materials Assessment
BUILDING: B 678
Site: Newport Naval Base

DATE: 10/26/15
TECHNICIAN: William Weisgerber, Jr
PROJECT #: 15-020670-01

TYPE OF ANALYSIS
- ☐ PLM, EPA/600/R-93/116
- ☐ Stop @ 1st Positive ID No.
- ☐ PLM EPA NOB (Gravimetric)

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

SAMPLE ID	MATERIAL / (ID No.)	SAMPLE LOCATION	ADDITIONAL ANALYSIS
11 5777707 BW 102615	Adhesive Assoc. w/ EFIS (06)	Facade East	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
12 5777708	Yellow Caulk @ Interface of EFIS & Concrete (07)	Facade South	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
12A 5777709	Grey/Clear Caulk @ Interface of EFIS & Concrete (08)	Facade East	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
13 5777710	Grey Caulk @ Interface of Brick to Concrete (09)	Facade South	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
14 5777711	Black Sealant @ interface of concrete lintel & brick (10)	Facade West	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
15 5777712	White Sealant @ Metal Duct Seams (11)	2nd Flr, Laundry	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
16 5777713	Cream, Peach, Grey Speckled Sheet Flooring (12)	Kitchen 3rd Flr, Room 39	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
16A 5777714	Yellow Adhesive Assoc w/ ID No. 12 (13)	↓	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
17 5777715	Yellow Pipe Dope Assoc. w/ Red Fire Suppression System (14)	Hallway 4th Floor	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
18 5777716	Grey Sealant @ Metal Duct Seams (15)	1st Flr, Ent. Lobby	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
19 5777717	4" Tan Cove Base (16)	Stair 2 - South	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
19A 5777718	White Adhesive Assoc. w/ ID No. 16 (17)	↓	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~

TURN-AROUND-TIME	
☐ 3 Hours	☐ 48 Hours
☐ 6 Hours	☐ 3 Days
☐ 24 Hour	☒ TEM, 2 Days

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
I.	10/26/15		I.	11/2/15	1540
II.	11/2/15	1625	II. RECEIVED		
III.			III.		

Rdbc 11-4-15

NOV - 2 2015

COMMENTS: * Straight to TEM NO PLM @ 110215

TEM @ ms 11/4/15 PLM @ JLone 110215

IATL - By

E-MAILED

USA Environmental Management, Inc.

344 West State Street
Trenton, New Jersey 08618

CLIENT: Burns & McDonnell
PROJECT: Hazardous Materials Assessment
BUILDING: B678
Site: Newport Naval Base

DATE: 10/26/15
TECHNICIAN: William Weisgerber, Jr.
PROJECT #: 15-020670-01

TYPE OF ANALYSIS
- ☐ PLM, EPA/600/R-93/116
- ☐ Stop @ 1st Positive ID No.
- ☐ PLM EPA NOB (Gravimetric)

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

SAMPLE ID	MATERIAL / (ID No.)	SAMPLE LOCATION	ADDITIONAL ANALYSIS
5777719 20BW102615	Red Fire Stop @ Wall Penetrations (18)	5th Fl., Hall @ Room 53	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
21 5777720	Yellow Pipe Dope Assoc. w/ Condensation Lines (19)	Basement Mech Room	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
22 5777721	Mauve Stair Tread w/ Green + Grey Specks (20)	Stair 1 - North	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
22A 5777722	Yellow Adhesive Assoc. TD No. 20 (21)	↓	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
23 5777723	Brown Stair Tread (22)	Stair 2 - South	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
23A 5777724	White Adhesive Assoc. w/ TD No 22 (23)	↓	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
24 5777725	1/4" Pink Mottled Pattern Floor Tile (24)	4th Fl, Laundry	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
24A 5777726	Black Mastic Assoc. w/ TD No. 24 (25)	↓	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
25 5777727	Yellow Carpet Adhesive (26)	1st Fl., Lobby	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
26 5777728	White Sealant @ Fiberglass P.I. Ends (27)	Basement Mech Room	☒ TEM EPA NOB ~~(if ND or <1% by PLM)~~
			☐ TEM EPA NOB (if ND or <1% by PLM)
			☐ TEM EPA NOB (if ND or <1% by PLM)

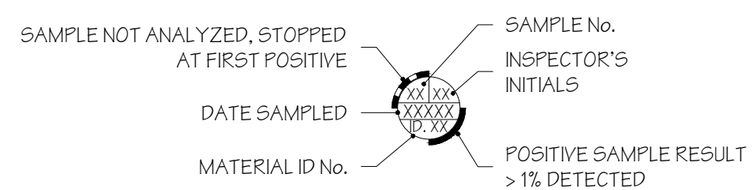
TURN-AROUND-TIME	
☐ 3 Hours	☐ 48 Hours
☐ 6 Hours	☐ 3 Days
☐ 24 Hour	☒ TEM, 2 Days

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
I. [signature]	10/26/15		I. [signature]	10/26/15	
II. [signature]	11/2/15	1625	II.		
III.			III.		

COMMENTS: Straight to TEM No PLM

1 / HA.1 BUILDING 678 - BASEMENT
SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

- William Weisgarber, Jr., Building Inspector ■ Certificate No. NAETI 44009
- Richard Reynolds, Building Inspector ■ Certificate No. NAETI 45213
- Wayne K. Martin, Building Inspector ■ Certificate No. NAETI 43333

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Trenton, NJ 08618
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Environmental, Engineering & Construction

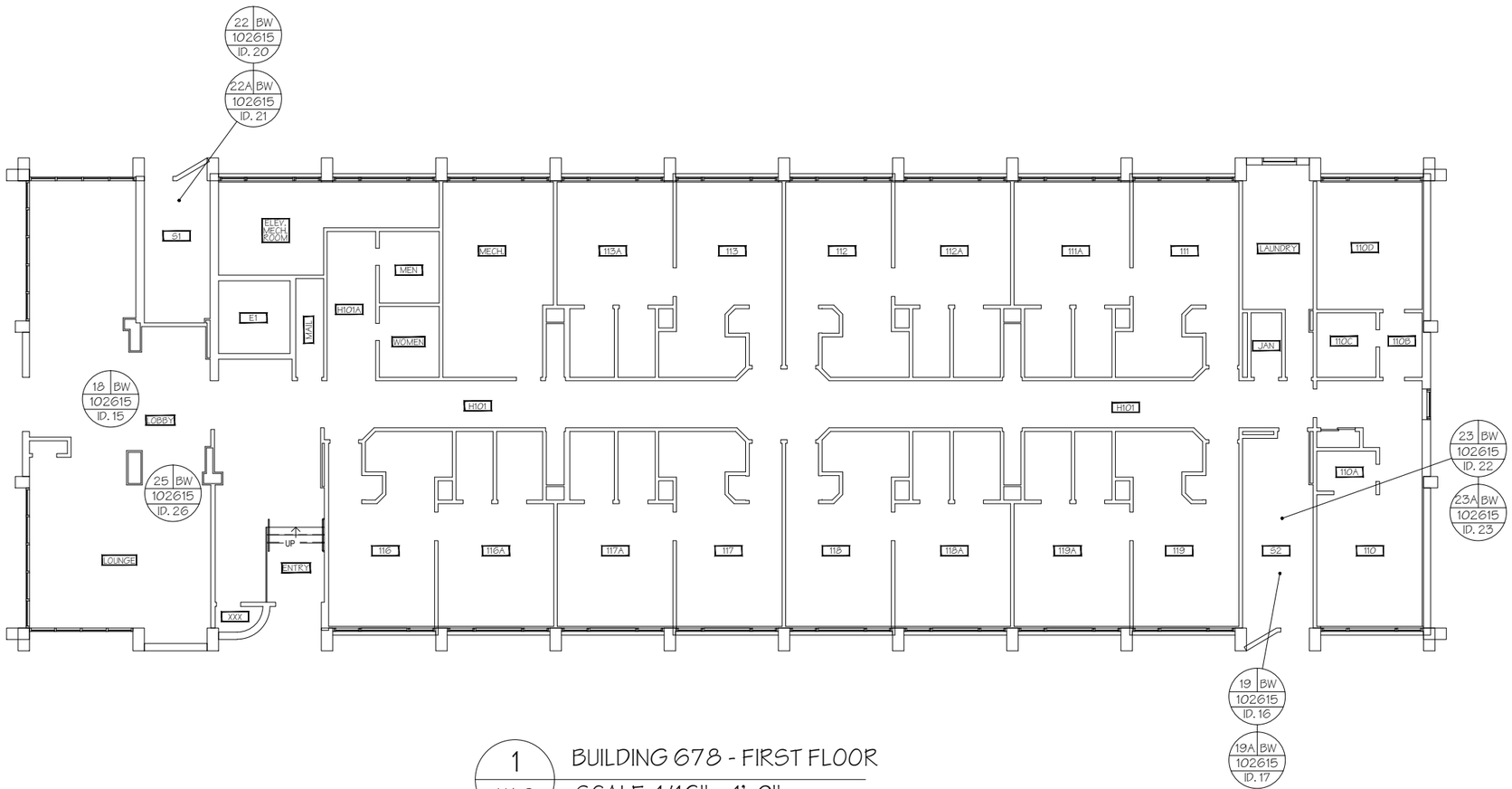
Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 Basement

Drawing No. HA.1

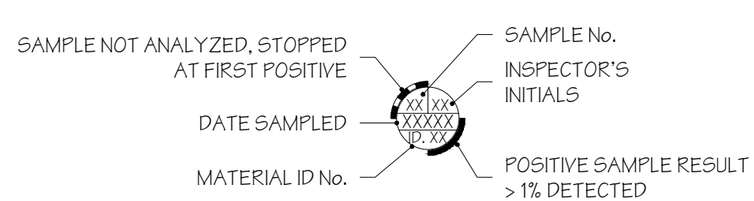
Sheet: 1 of 8



1 / HA.2 BUILDING 678 - FIRST FLOOR

SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

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▪ Certificate No. NAETI 44009

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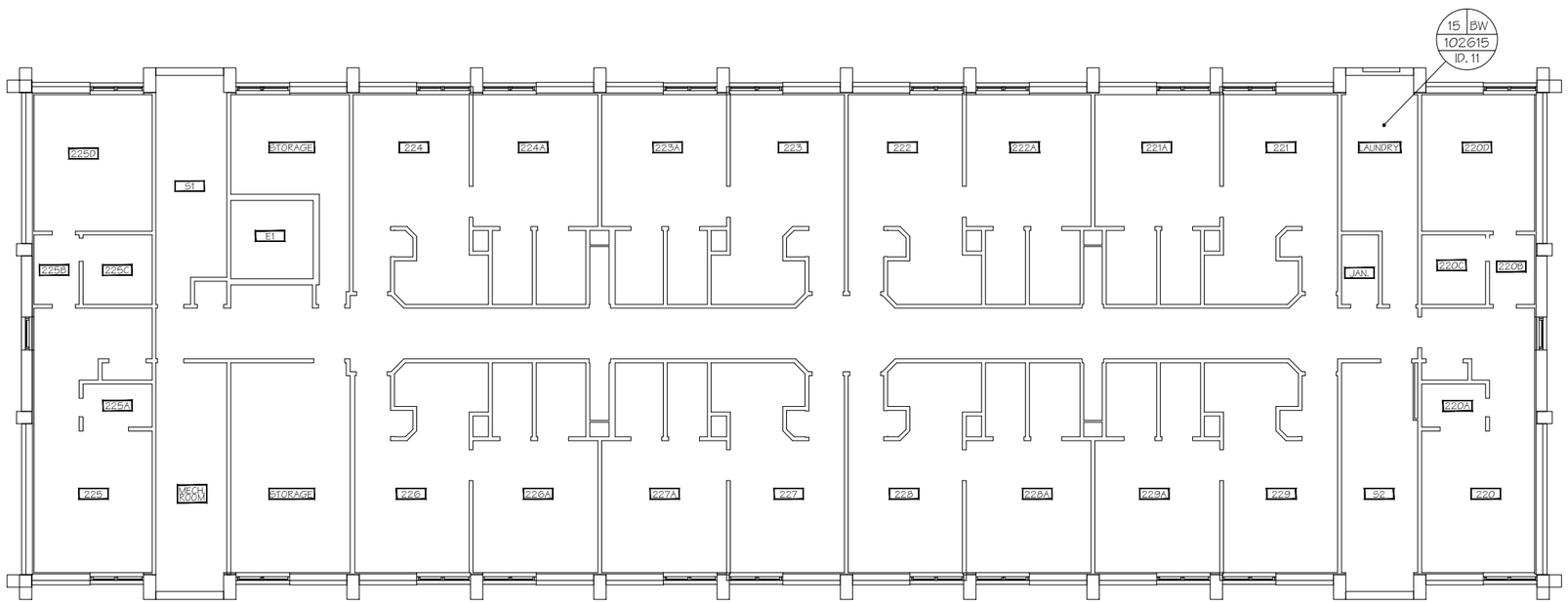
Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 First Floor

Drawing No. HA.2

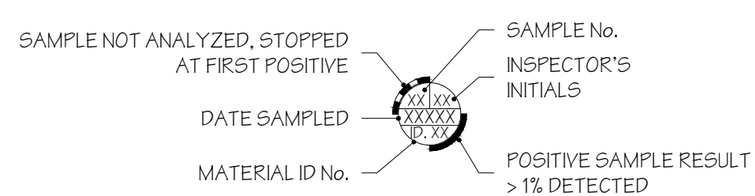
Sheet: 2 of 8



1 / HA.3 BUILDING 678 - SECOND FLOOR

SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

- William Weisgarber, Jr., Building Inspector
- Certificate No. NAETI 44009

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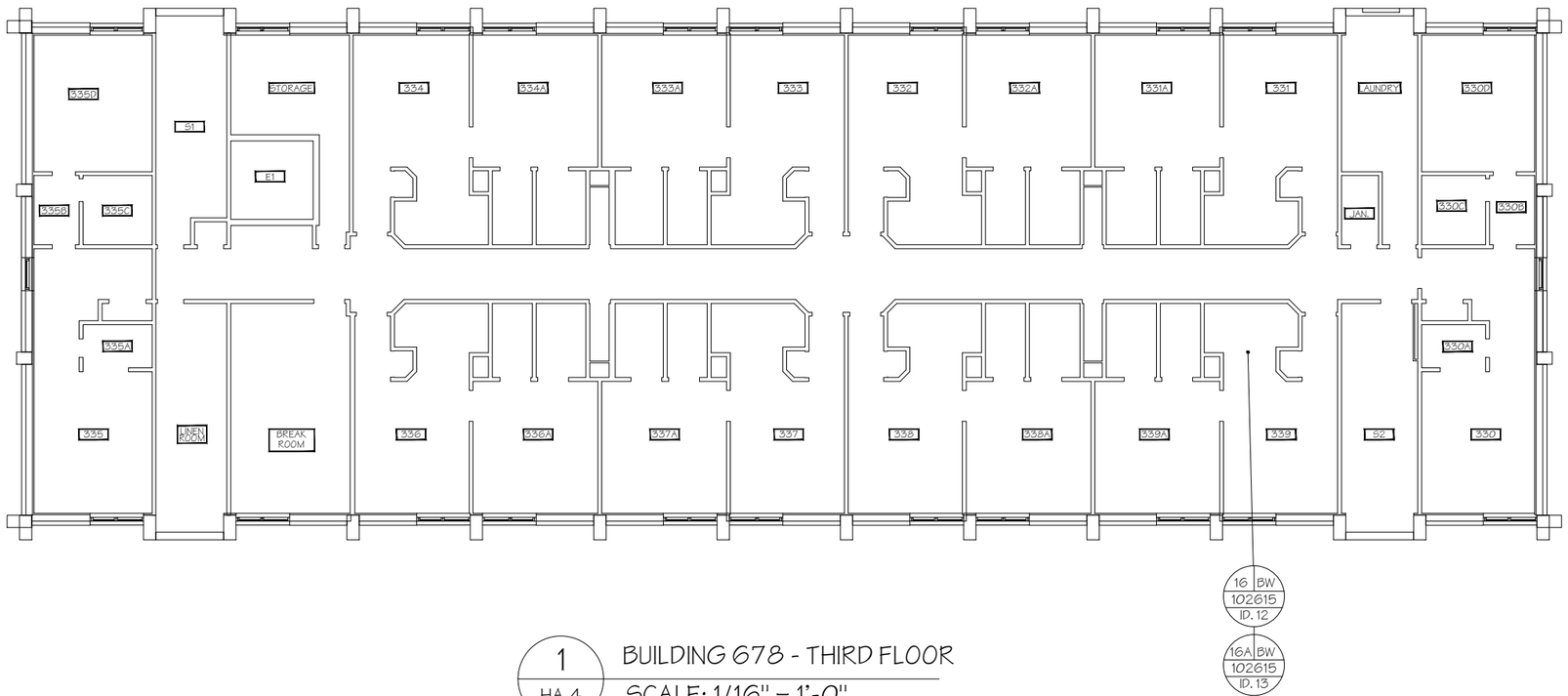
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title:
Bluk Sample Locations Building 678 Second Floor

Drawing No.
HA.3

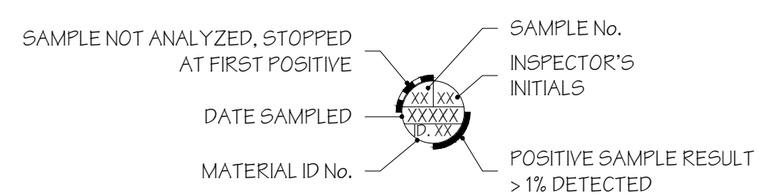
Sheet: 3 of 8



1 / HA.4 BUILDING 678 - THIRD FLOOR

SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

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▪ Certificate No. NAETI 44009

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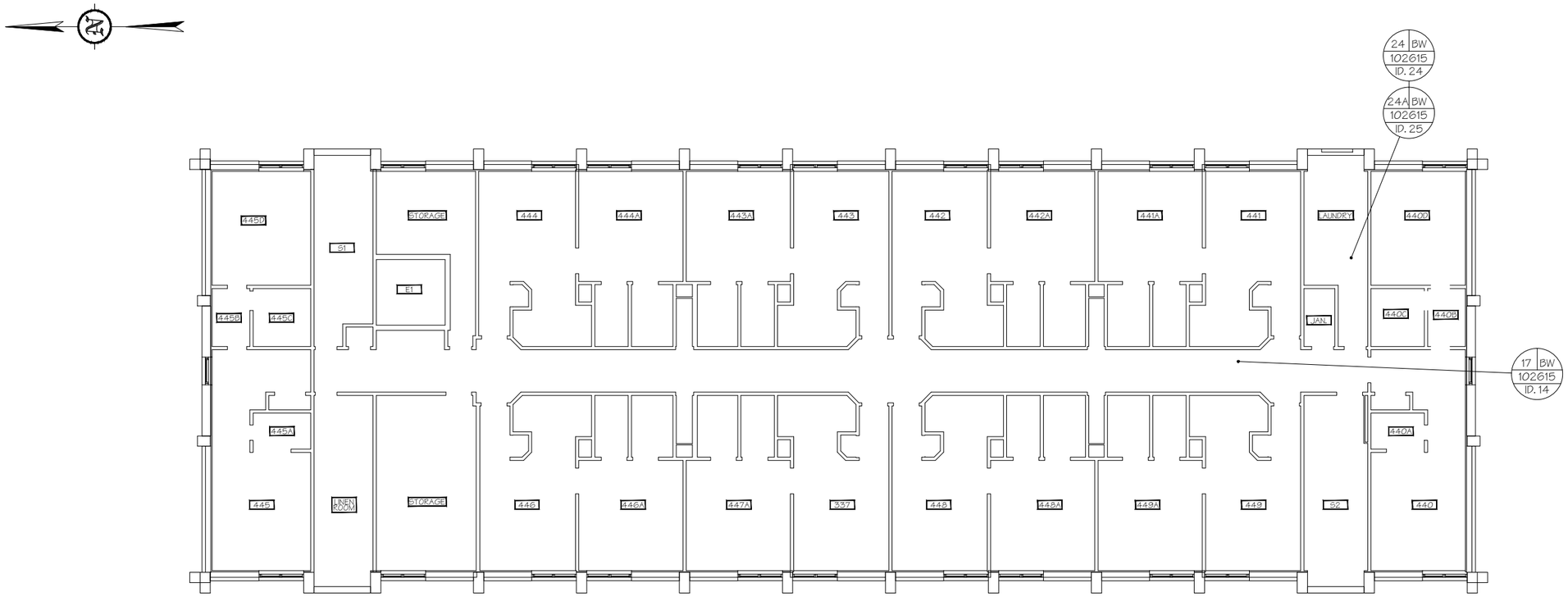
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 Third Floor

Drawing No. HA.4

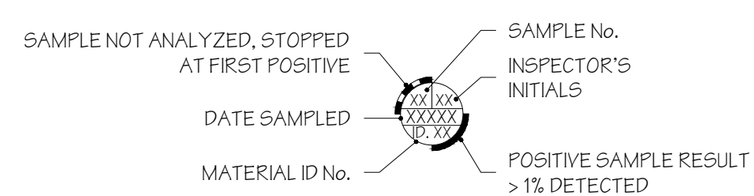
Sheet: 4 of 8



1 / HA.5 BUILDING 678 - FOURTH FLOOR

SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

▫ William Weisgarber, Jr., Building Inspector

▪ Certificate No. NAETI 44009

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Environmental, Engineering & Construction

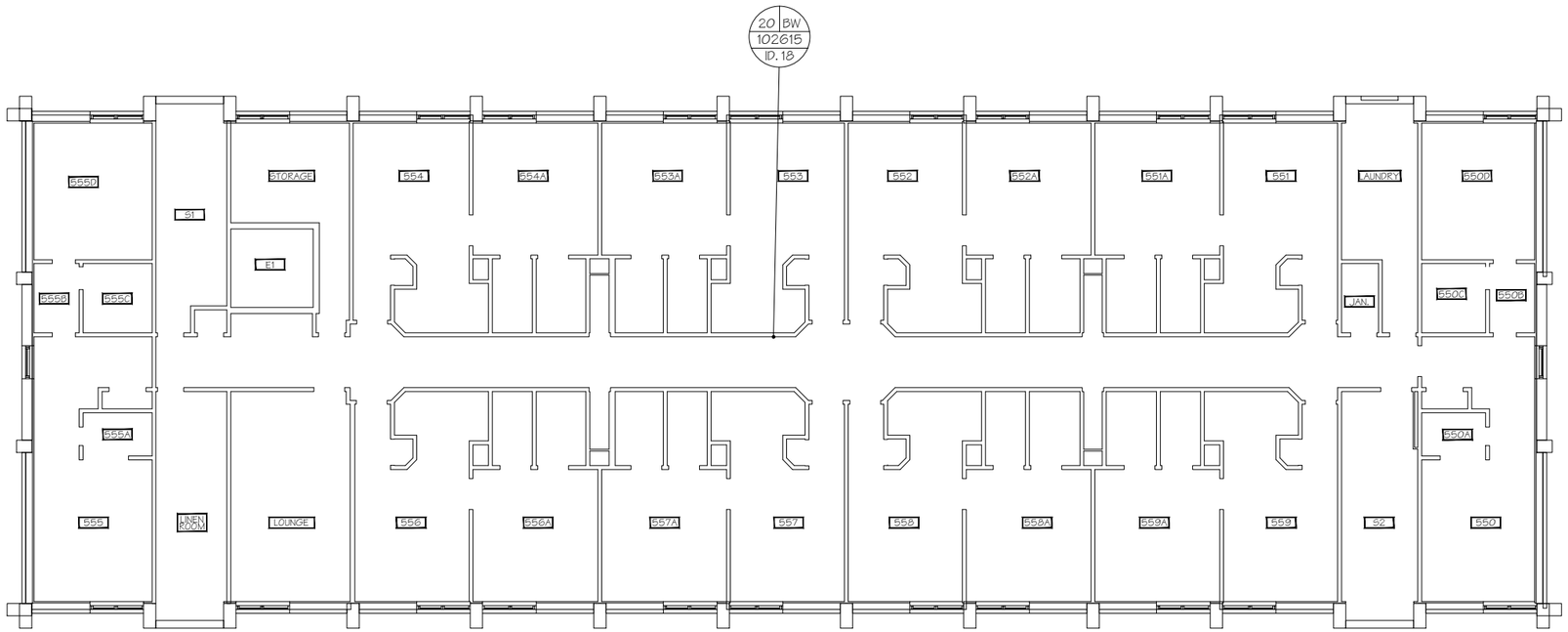
Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 Fourth Floor

Drawing No. HA.5

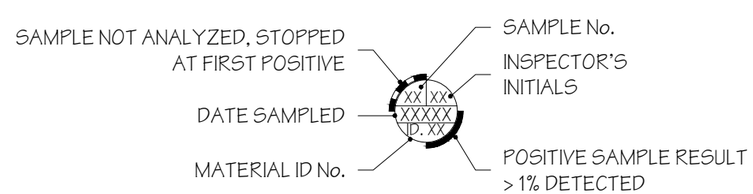
Sheet: 5 of 8



1 / HA.6 BUILDING 678 - FIFTH FLOOR

SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

▫ William Weisgarber, Jr., Building Inspector
▪ Certificate No. NAETI 44009

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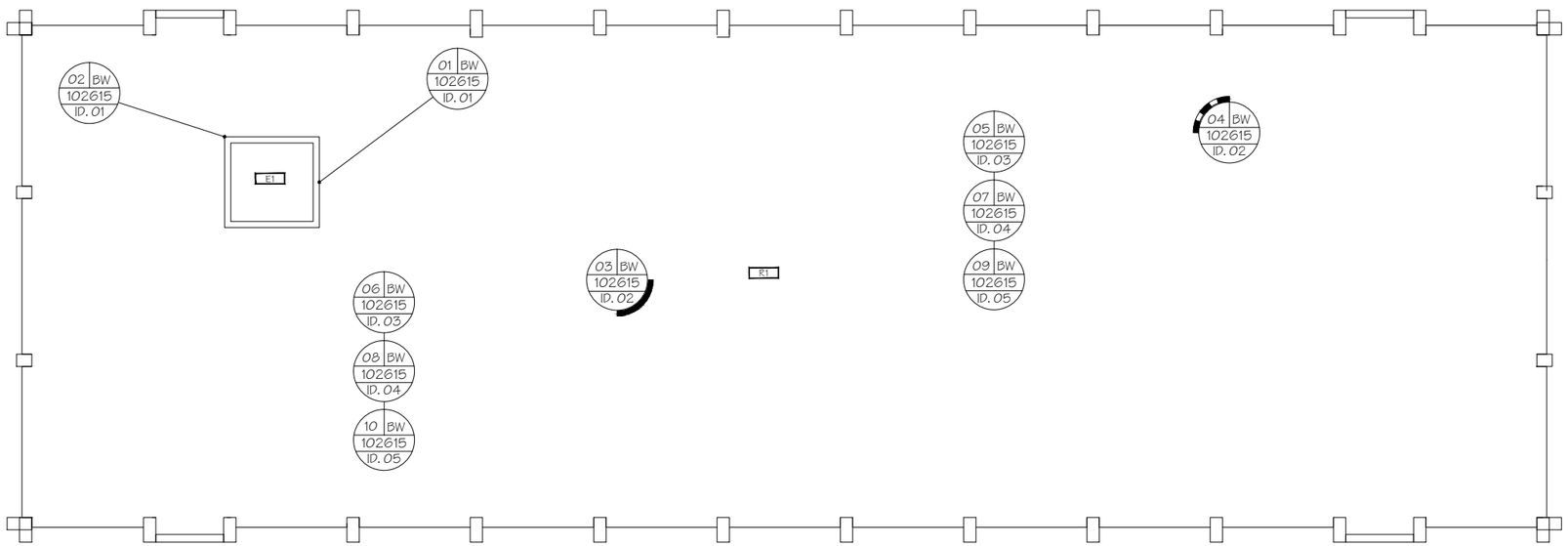
Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 Fifth Floor

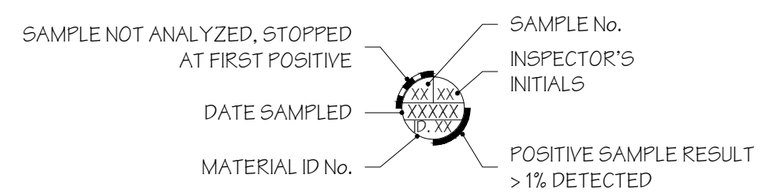
Drawing No. HA.6

Sheet: 6 of 8



1 / HA.7 BUILDING 678 - ROOF PLAN
SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

- William Weisgarber, Jr., Building Inspector
- Certificate No. NAETI 44009

USA Environmental Management, Inc.
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Trenton, NJ 08618
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Environmental, Engineering & Construction

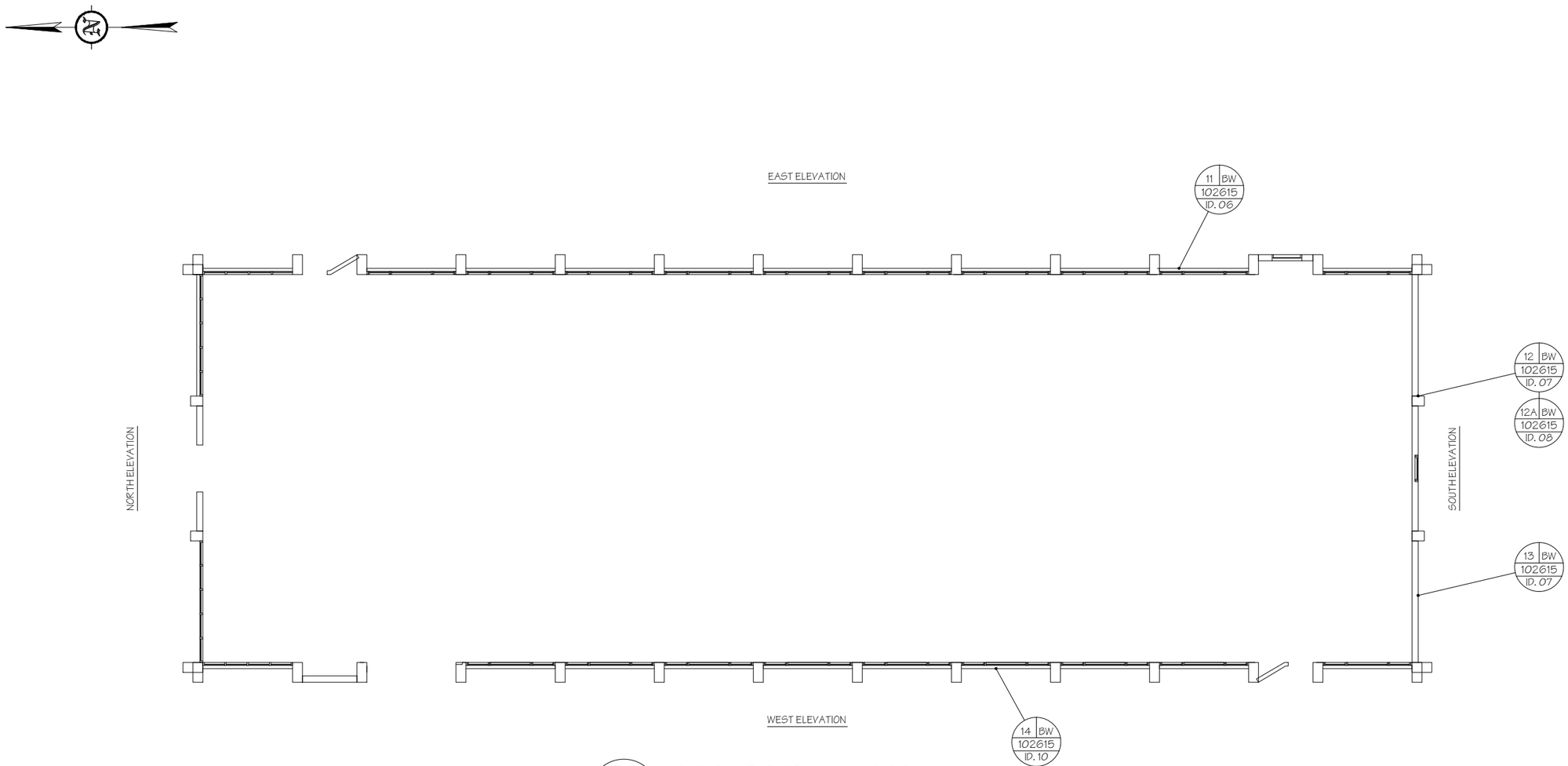
Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title: Bluk Sample Locations Building 678 Roof Plan

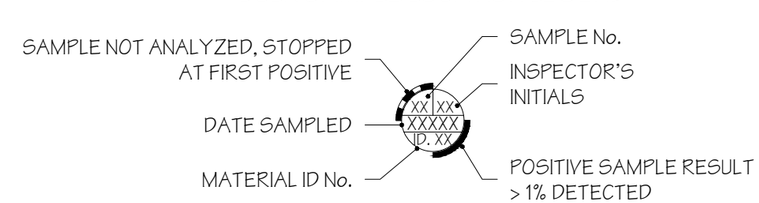
Drawing No. HA.7

Sheet: 7 of 8



1 / HA.8 BUILDING 678 - EXTERIOR
SCALE: 1/16" = 1'-0"

- BULK SAMPLE LOCATION LEGEND -



Rev:	Date:	By:

USAEMI Project Number: 15-020670-01

Scale: AS NOTED

Checked by: W.W.J.

Date: 11-12-2015

Drawn by: W.K.M.

- William Weisgarber, Jr., Building Inspector
  - Certificate No. NAETI 44-009
- Richard Reynolds, Building Inspector
  - Certificate No. NAETI 45213
- Wayne K. Martin, Building Inspector
  - Certificate No. NAETI 43333

USA Environmental Management, Inc.
344 West State Street
Trenton, NJ 08618
609.656.8101
Environmental, Engineering & Construction

Naval Station Newport
Newport, Rhode Island

Hazardous Building Materials Survey for Building 678

Drawing Title:
Bluk Sample Locations Building 678 Exterior

Drawing No.
HA.8

Sheet: 8 of 8

Rhode Island Department of Health

Asbestos Program

Asbestos Inspector

WILLIAM WEISGARBER, JR

Exp. Date: 03/30/2016
License #: AAC-0819

Member of C.O.N.E.S.

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101048-0

EMSL Analytical, Inc.

Cinnaminson, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-06-02 through 2016-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary
Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Mr. Ben Ellis
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Email: bellis@emsl.com
http://www.emsl.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101048-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

International Asbestos Testing Laboratories
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ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101165-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101165-0

International Asbestos Testing Laboratories

Mt. Laurel, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-06-16 through 2016-06-30

Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

APPENDIX B

H&S Environmental, Inc. – Hazardous Building Materials Survey

Hazardous Building Materials Survey Report For Building #678

Naval Station Newport
Newport, Rhode Island

Prepared by:

H&S Environmental, Inc.
160 East Main Street, Suite 2F
Westborough, Massachusetts 01581

September 2011

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE OF WORK....1
2.0 SITE DESCRIPTION....1
3.0 INSPECTION PERSONNEL, METHODS AND LABORATORIES....1
3.1 Inspection Personnel and Process....1
3.1.1 Inspection Personnel....1
3.1.2 Inspection Process....1
3.2 Asbestos Investigation....1
3.2.1 Methodology....2
3.2.2 Definition of Key Inspection Terms....2
3.3 Asbestos Laboratory Services....3
3.3.1 PLM Bulk Sample Analysis....3
3.3.2 Analytical Quality Control Program....3
3.4 LCP Investigation....4
3.4.1 Introduction....4
3.4.2 Testing Methodology....4
3.4.3 XRF Testing Procedures....4
3.4.4 Bulk Paint Chip Sample Analysis....5
3.5 Polychlorinated Biphenyls (PCBs) and DEHP Investigation....5
3.6 Mercury Light Tubes and Thermostats Investigation....5
3.7 Chlorofluorocarbons (CFCs) Investigation....6
3.8 Air Sampling for Mold Concentrations....6
4.0 FINDINGS AND RECOMMENDATIONS....6
4.1 Asbestos-Containing Materials....6
4.1.1 Materials Classified as Asbestos Containing....6
4.1.2 Non-Asbestos-Containing Materials....7
4.2 Lead–Containing Paint....8
4.3 Polychlorinated Biphenyls (PCBs) and DEHP....8
4.4 Mercury....9
4.5 Chlorofluorocarbons....9
4.6 Air Sampling for Mold Concentrations....10

APPENDICES

Appendix A Asbestos Bulk Sample Laboratory Analysis Results
Appendix B Lead Containing Paint Bulk Sample Laboratory Analysis Results & XRF Form
Appendix C Hazardous Building Materials Inventories
Appendix D Mold Air Sampling Laboratory Report with Extended Fungal Summary
Appendix E Site Photographs (As of January 25, 2010)

CERTIFICATION OF RESULTS

This report has been prepared for the exclusive use of the Client, Gale Associates, Inc. and the United States Navy. Photocopying of this document by parties other than those designated by the Client or its affiliates or use of this document for purposes other than it is intended, is prohibited.

Respectfully submitted this 28th day of September 2011.

Report Prepared by:

Matthew Buccella
Building Inspector

Report Reviewed by:

Sean Hurley
Project Manager

1.0 PURPOSE AND SCOPE OF WORK

H&S Environmental, Inc. (H&S) performed a hazardous building materials (HBM's) investigative survey of Building # 678 (the Site) located on the campus of the Naval Station Newport (NSN) located in Newport, Rhode Island. The purpose of the survey was to identify and confirm the presence or absence of asbestos-containing materials (ACMs), lead-containing paints (LCPs), Polychlorinated Biphenyls (PCBs), Mercury, Chlorofluorocarbons (CFCs) and Mold in preparation for possible site redevelopment including renovations and/or demolition of the structure.

The hazardous building materials inspection was conducted on September 15, 2011 in all accessible areas of the site excluding the roof. H&S using an experienced and accredited/licensed inspector and a licensed laboratory as described in Section 3.0 performed the inspection. Specific inspection methods, procedures, definitions and limitations are discussed in Sections 3.2 & 3.3. Section 4.0 contains a discussion of the results of our inspections and H&S's recommendations.

2.0 SITE DESCRIPTION

The site consists of a five-story concrete and brick veneer structure. The building is metal framed. The interior consists of gypsum board walls, 2' x 2' ceiling tile, carpet and resilient flooring materials (i.e. – floor tile & sheet flooring). The facility is currently occupied and functions as living quarters.

3.0 INSPECTION PERSONNEL, METHODS AND LABORATORIES

3.1 Inspection Personnel and Process

3.1.1 Inspection Personnel

The investigative survey was conducted on September 15, 2011 by trained and certified Rhode Island licensed Asbestos Inspector, Mr. Matthew Buccella (License # AAC-0817IS) an experienced asbestos containing materials inspector.

3.1.2 Inspection Process

The inspection for hazardous building materials was conducted in a systematic manner using H&S's standard safety procedures and inspection protocol including:

1. Interviews with individuals knowledgeable about the building. No existing written documentation / information was available regarding the presence or absence of hazardous building materials.

2. A visual inspection of accessible areas of the affected building areas to locate, quantify, and assess the condition of materials suspected to contain asbestos, LCP, PCBs/DEHPs, CFCs, Mercury and Mold

3. Collection and analysis of materials as described herein to determine composition.

3.2 Asbestos Investigation

3.2.1 Methodology

The inspection for suspect ACMs included:

1. Collection of representative bulk samples of each homogeneous area or application of suspect material in sufficient numbers to comply with the Environmental Protection Agency (EPA) / Asbestos Hazard Emergency Response Act (AHERA) minimum criteria (see Chart A below).

2. To prevent release of any airborne asbestos, samples were collected by first carefully wetting the suspect materials and then removing a small full-thickness sample and placing it in a sealed plastic bag labeled with a unique sample identification number.

3. Chain-of-custody documentation was used to ensure sample integrity.

4. Analysis of the bulk samples at an accredited laboratory using the EPA approved Polarized Light Microscopy (PLM) method.

5. A review of the inspection findings and lab results to ensure proper and consistent identification and characterization of all assumed and confirmed ACMs.

Chart A **Minimum Asbestos Bulk Sampling Criteria**	
Type of Suspect Material	Minimum Sampling Criteria
Surfacing	EPA/AHERA mandated statistically random criteria (Min. of 3 Samples; Max. of 7 Samples)
Miscellaneous	Minimum of 2 samples of each homogeneous application (unless otherwise noted)
Thermal System Insulations	Three random samples of each homogeneous application.

3.2.2 Definition of Key Inspection Terms

Given the specific purposes and objectives of this inspection, the following definitions were used for the terms: suspect materials, homogeneous applications or areas of suspect materials, friable materials, inaccessible building areas, and confirmed ACMs:

1. Suspect Materials: Building materials that may contain asbestos. The following materials are considered non-suspect and were not sampled or assessed if observed:

   - Plastic
   - Glass
   - Wood or Wood Composite Materials
   - Brick, Granite, Marble, or Other Stonework
   - Pink or Yellow Fiberglass Insulation on Pipes or Other Mechanical Components
   - Clay or Ceramic Tiles
   - Rubber or Synthetic Foam
   - Paint (unless textured)
   - Concrete or Mortar (except Gyp-Crete)
   - Carpeting, Curtains, Wallpaper, and Other Paper/Natural Fiber, Fabric, or Synthetics

2. Homogeneous Applications or Areas: Suspect materials which serve the same function or purpose (e.g., floor or ceiling tiles), have similar color and texture and were likely installed at or near the same time. Homogeneity is a determining factor in calculating the number of bulk samples collected for a particular material.

3. Friable Materials: Suspect materials that may be easily reduced to a powder by applying hand pressure, (e.g., sprayed-on fireproofing as opposed to a non-friable material such as vinyl floor tile).

4. Inaccessible Building Areas: Building areas, systems, structural components, or surfaces which could not be observed because it was unsafe or impractical to demolish, disassemble, or remove systems or coverings, or because a human being cannot physically enter or observe the area or component. Inaccessible areas include below grade building foundations, pipe trenches and utility vaults/corridors, electrical equipment/wire, pipe gaskets, in-filled window openings, fire doors and enclosed wall and ceiling cavities.

5. Confirmed ACMs: Suspect materials where at least one (1) of the collected bulk samples contained an asbestos concentration of 1% or more. According to EPA's AHERA criteria, all bulk samples of a homogeneous area of suspect ACM must be found to contain less than 1% asbestos to conclude that the material is not regulated as an ACM by EPA under the National Emissions Standard for Hazardous Air Pollutants regulation (NESHAPs).

3.3 Asbestos Laboratory Services

3.3.1 PLM Bulk Sample Analysis

A total of forty-four (44) bulk samples were collected during the inspection and were submitted to EMSL Analytical Services, Inc. (EMSL) located in Woburn, Massachusetts for analysis. EMSL is fully accredited for bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology (NIST). Bulk samples were analyzed for asbestos content using EPA Method 600/R-93/116.

3.3.2 Analytical Quality Control Program

The AmeriSci quality assurance and control program was developed in strict compliance with NIST/NVLAP requirements.

3.4 LCP Investigation

3.4.1 Introduction

Historically, lead was added to paint because its color stability properties made it a desirable pigment and because it enhances durability. Lead-containing paint becomes harmful when inhaled as dust or fumes or when ingested. Once lead pigment was proven to be a health hazard, it was officially banned in 1978 from paint applied in residences.

In an occupational or industrial setting, if lead-containing painted surfaces are to be impacted by renovation or demolition activities, contractor personnel exposure (per OSHA compliance) and waste disposal (per EPA compliance) issues must be addressed and factored into the cost of the project. Specifically, contractors are required to comply with all applicable OSHA regulations including 29 CFR 1926.62 *Lead Exposure on Contractors Interim Final Rule* and 29 CFR 1926.59 *Hazard Communication for the Construction Industry*. These regulations are applicable for all construction workers that are involved in activities that impact lead containing paint and/or generate airborne lead.

3.4.2 Testing Methodology

H&S utilized a Portable X-Ray Fluorescence Analyzer (XRF) to perform the lead-containing paint survey. The XRF is a hand held instrument that contains a radioisotopic source and operates on the principle of X-ray fluorescence. The depression of a spring-loaded button on the XRF unit opens a shutter in the faceplate that allows radiation from an isotopic source to stimulate the lead atoms in the paint. This stimulation causes the atoms to emit (fluoresce) X-rays, which the unit detects and converts into electrical pulses. These pulses are then sorted and counted and the result is read through a digital display on the instrument.

Surface levels of lead are measured in units of milligrams per square centimeter (mg/cm^2). The XRF used in this survey, the Niton Model XL Analyzer, is able to detect as little as 0.01 mg of $lead/cm^2$. OSHA classifies any substance with a detectable amount of lead to be a "lead-containing" material. The Niton XL Lead Paint Analyzer quickly, accurately, and non-destructively measures the concentration of paints and surface coatings.

3.4.3 XRF Testing Procedures

Upon arrival at the job site, a "validation test" is performed to ensure that the XRF instrument is operating properly. The validation test is performed on a calibration test sheet supplied by the manufacturer to determine if the instrument is measuring the lead content consistently. During this survey the instrument was functioning within the standard deviation as defined by the manufacturer.

In conducting the LCP survey, representative tests were performed on homogeneous (similar color, texture, and use) painted surfaces throughout the building. Results were related to other surfaces

possessing similar homogeneous characteristics. By following this sampling protocol, every painted surface did not have to be sampled.

3.4.4 Bulk Paint Chip Sample Analysis

In addition to the XRF testing, one (1) bulk paint chip sample was collected and analyzed to confirm the XRF results. The sample was submitted to EMSL Analytical Services, Inc. (EMSL) located in Woburn, Massachusetts. EMSL is fully accredited for lead bulk sample analysis under the Environmental Lead Proficiency Analytical Testing (ELPAT) Program administered by the American Industrial Hygiene Association (AIHA). The bulk paint chip sample was analyzed for lead content using Atomic Absorption Spectrophotometry (AAS) under EPA Method SW846-7420. Results are included in Appendix C - XRF Tables and Laboratory Results for Lead Containing Paint Testing.

3.5 Polychlorinated Biphenyls (PCBs) and DEHP Investigation

H&S performed an inspection of the Site to identify suspect PCB-containing fluorescent light ballasts and transformers. Additionally fluorescent light fixtures were identified and inventoried for the possible presence of di (2-ethylhexyl) phthalate (DEHP). The survey was conducted in a systematic manner that included:

1. Performing a detailed walk-through to visually inspect and categorize the various types of accessible fluorescent light fixtures.

2. Selecting a representative number of light fixtures to inspect.

3. Listing pertinent information from light ballast labels or nameplates affixed during the manufacturing process.

4. Preparing an inventory of electrical light ballasts and transformers known or suspected to contain PCBs or DEHP.

3.6 Mercury Light Tubes and Thermostats Investigation

An inspection was conducted throughout the Site to identify suspect Mercury-containing equipment and materials as follows:

1. Performing a walk-through and preparation of an inventory of fluorescent light bulbs that may contain Mercury vapor.

2. Performing a walk-through to identify and inventory thermostats and other equipment that contain liquid Mercury.

3.7 Chlorofluorocarbons (CFCs) Investigation

An inspection was conducted throughout the Site to identify suspect chlorofluorocarbons (CFCs) associated with refrigeration and air conditioning equipment. The survey included performing a walk through of the building and preparation of an equipment inventory including an estimate of the size of the unit and/or the estimated quantity of CFCs.

3.8 Air Sampling for Mold Concentrations

To sample for non-viable airborne fungi, H&S used air-sampling cassettes with sampling pumps to draw air onto the filter media. The filter media is sent to an accredited laboratory for microscopic analysis. The airborne aerosols that are trapped on the filter media include mold spores, pollen, insect parts, skin cell fragments, fibers and inorganic particulate.

The sampling cassette is designed to operate at 15 liters per minute (LPM). The sampling period is dependent upon the density of the particulate in the environment. In normal office building conditions the LPM for the pumps are set at higher levels. In most buildings foot traffic and activities are at low to moderate levels. In busier buildings, such as airport terminals, the LPM is at lower levels (5 LPM). In heavy construction areas, the LPM is set at the lowest level (1 LPM). For this investigation, H&S used 15 LPM for eight (8) minute sample durations. The air sampling pump was calibrated with a BIOS DryCal® DC-Lite primary flow meter.

The samples were delivered to EMSL Analytical Services Inc. (EMSL) located in Woburn, Massachusetts. Chain-of-custody documentation was used to ensure sample integrity. EMSL is accredited under the American Industrial Hygiene Association (AIHA). Once processed by the laboratory receiving area, the samples were analyzed by optical microscopy (non-viable). Results are reported as Total Fungi Counts (counts per cubic meter). In addition, identification of mold genus was performed which identified the primary mold colonizers. Please see Appendix D - Mold Air Sampling Laboratory Report with Extended Fungal Summary.

4.0 FINDINGS AND RECOMMENDATIONS

4.1 Asbestos-Containing Materials

4.1.1 Materials Classified as Asbestos Containing

A total of two (2) bulk samples collected from materials from the specified areas confirmed the presence of ACM's. The materials **confirmed** to contain asbestos in the inspected areas are summarized as follows:

Location	Material
Exterior; East Side of Building; Under Brick Façade	Damp-Proofing Material

4.1.2 Non-Asbestos-Containing Materials

The following materials have been classified as **non-ACMs** in the inspected areas:

Location	Material
Exterior; South & East Side of Building	Exterior Finish Insulation System (EFIS)
Exterior; South & East Side of Building	EFIS Adhesive
Exterior; South & East Side of Building	Caulking (EFIS to Concrete)
Exterior; East Side of Building	Original Caulking (Brick to EFIS)
Exterior; South & East Side of Building; First Floor	Original Window Caulking
Exterior; South & East Side of Building; Second Floor	Caulking (Brick to Concrete)
Interior; Units 27 & 40; Kitchen	Speckled Sheet Flooring & Associated Adhesive
Interior; Units 28 & 59; Living Room	Fire Stop Putty (Red)
Interior; Units 28 & 40; Kitchen	2’ x 2’ Ceiling Tile
Interior; Second Floor & Fifth Floor; Hallway; Utility Closet	Air Duct Seam Sealant
Interior; Unit 29; Living Room, Second Floor; Storage Room, Unit 40; Living Room	Joint Compound
Interior; Units 29 & 40; Bathroom	2’ x 2’ Ceiling Tile (Plaster)
Interior; Second Floor; Storage Unit, Third Floor; Laundry Room	12” x 12” Floor Tile (& Associated Mastic)
Interior; Second Floor; Storage Unit, Third Floor; Laundry Room	Covebase Adhesive
Interior; Third Floor; Employee Break Room, Unit 59; Living Room	Carpet Mastic
Interior; First Floor; Mechanical Room	End Cap Paint (On Fiberglass Insulation)

4.1.3 Discussion and Recommendations

The mere presence of asbestos in a building does not mean that the health of building occupants is necessarily at risk. As long as the ACMs remain in good condition and are not disturbed, exposure is unlikely. However, when building maintenance, repair, renovation, demolition or other activities disturb ACMs, or if ACMs are damaged, asbestos fibers are released creating a potential hazard to building occupants. Contractors and employees performing demolition, construction or renovation activities must be informed of the presence of ACMs if the activities may impact these materials.

H&S recommends that all ACMs be removed by a Rhode Island-licensed Asbestos Contractor prior to demolition or renovation of the building.

Until all ACMs are removed, they should be managed according to governing regulations. All ACMs in each of the buildings should be included in a site-specific asbestos operations and maintenance (O&M) program designed at a minimum to comply with 29 CFR 1910.1001 and 1926.1101, incorporating the basic components outlined in the EPA's *Guide to Managing Asbestos in Buildings*. No other actions are recommended at this time.

4.2 Lead–Containing Paint

Testing was performed on primary coated surfaces located throughout the building. A total of one (1) bulk chip was analyzed for lead content. Results of the components indicated that the coatings contain very low concentrations of lead. Detailed results are presented in Appendix B - Lead Containing Paint Bulk Sample Laboratory Analysis Results & XRF Form.

Although the HUD[(1)] lead paint standard classifies lead-based paint (LBP) as that having $\geq$0.5% of lead by weight as analyzed by Atomic Absorption. For the purposes of renovation and/or demolition work, OSHA defines lead-containing paint (LCP) as any paint containing detectable amounts of lead.

The current interpretation of the EPA's Resource Conservation and Recovery Act (RCRA) requires that waste generated during projects where LCPs are present and will be disposed of is tested for the toxicity characteristic of lead in the waste stream. Toxicity Characteristic Leachate Procedure (TCLP) testing is performed to determine whether the waste (construction debris) must be classified as hazardous because of its lead content or if it can be disposed in a conventional construction and demolition (C&D) landfill. The regulatory limit for lead toxicity is 5.0 milligrams per liter (mg/L) using the EPA reference Method SW846-7420 for Atomic Absorption Spectroscopy (AAS).

4.3 Polychlorinated Biphenyls (PCBs) and DEHP

Representative fluorescent light fixtures were inspected throughout the site to determine if the ballasts contained polychlorinated biphenyls, PCBs. Additionally fluorescent light fixtures were identified and inventoried for the possible presence of di (2-ethylhexyl) phthalate (DEHP). Ballasts that do not have labels indicating the absence of PCBs should be assumed to contain PCBs. Ballasts

[(1)] U.S. Department of Housing and Urban Development

that do not contain PCBs should be assumed to contain DEHP. All of the ballasts were observed to be undamaged and not leaking fluids.

All of the representative light fixtures that were inspected were found to have "No PCBs" labeling. As such, the ballasts should be handled as non PCB-containing. However, since the investigation involved inspecting only a representative number of ballasts, all ballasts should be checked for labeling before they are disposed of. Those, which are not labeled "No PCBs", must be removed, packaged and disposed of in accordance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal.

There are two methods currently available for disposal of PCB ballasts including incineration (recycling) and disposal. Incineration is typically more expensive but is believed to reduce the "cradle to grave liability" for the Generator. Regardless of the method, documentation of proper disposal should be provided to the Owner/Generator.

4.4 Mercury

An inventory of fluorescent light bulbs/tubes was prepared in conjunction with the investigation for PCBs (Appendix C). The fluorescent light bulbs located throughout the building are assumed to contain Mercury. All fluorescent light bulbs/tubes known or presumed to contain Mercury must be removed, packaged, handled, transported and disposed of in compliance with governing regulations.

Handling and disposal of all fluorescent light bulbs/lamps presumed to contain Mercury vapor should be performed in compliance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal as well as the EPA's Resource Conservation and Recovery Act (RCRA), and other governing regulations. Specific regulations pertaining to the handling, packaging, transportation and disposal (recycling) of Mercury liquid and vapor include the EPA Regulation 40 CFR, Parts 260 through 272.

Additionally, thermostats and associated mechanical equipment were inspected for the possible presence of liquid Mercury. H&S did not observe any elemental mercury vessels in the thermostats.

4.5 Chlorofluorocarbons

H&S observed several types or pieces of equipment that contained confirmed or assumed chlorofluorocarbons, (CFCs). Please see Appendix C for specific locations and quantity.

Chlorofluorocarbon removal, transportation and disposal should be performed by a qualified and experienced CFC reclamation contractor / firm in accordance with governing regulations (e.g. EPA's Clean Air Act Amendments) prior to removal and disposal of this equipment. Newer CFCs, which are unregulated as hazardous air pollutants, do not have similar removal, transport and disposal requirements.

4.6 Air Sampling for Mold Concentrations

Although there are no definitive levels set by Federal or State regulators for airborne fungi, the World Health Organization (WHO), as well as the Industrial Hygiene Community, laboratories and the American Conference of Governmental Industrial Hygienists (ACGHI), has adopted guidelines for assessing airborne fungi. Airborne fungi concentrations below 2,500 C/m^3 are normally not a concern for indoor environments. Airborne levels outdoors are normally between 500 and 1,500 C/m^3, but can easily exceed 20,000 C/m^3 during the spring and summer months.

Indoor airborne levels that exceed 5,000 C/m^3 are typically considered elevated and may be sufficiently elevated to show visible signs of mold contamination. The mold counts collected during this investigation are below the guidelines. Mold counts collected indoors when compared to the mold count collected outdoors, are considered low and should not pose a health risk to the majority of occupants.

APPENDIX A

Asbestos Bulk Sample Laboratory Analysis Results

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Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198
Project: **Naval Station Newport; Building 678; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/20/11 11:25 AM
EMSL Order: 131104441

EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-01A *131104441-0001*	Exterior; South Side of Bldg - Exterior Finish Insulation System (EFIS)	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-01B *131104441-0002*	Exterior; East Side of Bldg - Exterior Finish Insulation System (EFIS)	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-02A *131104441-0003*	Exterior; South Side of Bldg - EFIS Adhesive	Blue Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-02B *131104441-0004*	Exterior; East Side of Bldg - EFIS Adhesive	Blue Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-03A *131104441-0005*	Exterior; South Side of Bldg - Caulking @ Column (EFIS to Concrete)	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

Report Amended: 09/26/2011 16:18:44 Replaces the Inital Report 09/24/2011 14:58:25. Reason Code: Client-Additional Analysis

Analyst(s)

Kevin Pine (43)
Steve Grise (1)

Renaldo Drakes, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none dete require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Ir and use of test results are the responsibility of the client.Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available a upong request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-107T3 and VT AL357102

EMSL Analytical, Inc.
7 Constitution Way, Suite 107, Woburn, MA 01801
Phone: (781) 933-8411 Fax: (781) 933-8412 Email: bostonlab@emsl.com

Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198
Project: **Naval Station Newport; Building 678; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/20/11 11:25 AM
EMSL Order: 131104441

EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**		**% Type**
091311-06-03B *131104441-0006*	Exterior; East Side of Bldg - Caulking @ Column (EFIS to Concrete)	Gray Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-04A *131104441-0007*	Exterior; South Side of Bldg - Caulking @ Spandrel Beam (EFIS to Concrete)	White Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-04B *131104441-0008*	Exterior; South Side of Bldg - Caulking @ Spandrel Beam (EFIS to Concrete)	White Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-05A *131104441-0009*	Exterior; East Side of Bldg - Original Caulking (Brick to EFIS)	Gray/White Non-Fibrous Heterogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-05B *131104441-0010*	Exterior; East Side of Bldg - Original Caulking (Brick to EFIS)	Gray/White Non-Fibrous Heterogeneous		100%	Non-fibrous (other)	**None Detected**

Report Amended: 09/26/2011 16:18:44 Replaces the Inital Report 09/24/2011 14:58:25. Reason Code: Client-Additional Analysis

Analyst(s)

Kevin Pine (43)
Steve Grise (1)

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or other approved signatory

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EMSL Analytical, Inc.
7 Constitution Way, Suite 107, Woburn, MA 01801
Phone: (781) 933-8411 Fax: (781) 933-8412 Email: bostonlab@emsl.com

Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198
Project: **Naval Station Newport; Building 678; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/20/11 11:25 AM
EMSL Order: 131104441

EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-06A *131104441-0011*	Exterior; South Side of Bldg; 1st Fl - Original Window Caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-06B *131104441-0012*	Exterior; East Side of Bldg; 1st Fl - Original Window Caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-07A *131104441-0013*	Exterior; South Side of Bldg; 2nd Fl - Caulking; Brick to Concrete	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-07B *131104441-0014*	Exterior; East Side of Bldg; 2nd Fl - Caulking; Brick to Concrete	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-08A *131104441-0015*	Unit 27; Kitchen - Linoleum; Speckled	Gray Fibrous Heterogeneous	20%	Cellulose	80%	Non-fibrous (other)	**None Detected**
091311-06-08B *131104441-0016*	Unit 27; Kitchen - Linoleum; Speckled	Gray Fibrous Heterogeneous	20%	Cellulose	80%	Non-fibrous (other)	**None Detected**

Report Amended: 09/26/2011 16:18:44 Replaces the Inital Report 09/24/2011 14:58:25. Reason Code: Client-Additional Analysis

Analyst(s)

Kevin Pine (43)
Steve Grise (1)

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or other approved signatory

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EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-09A *131104441-0017*	Unit 27; Kitchen - Mastic a/w 08A	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-09B *131104441-0018*	Unit 27; Kitchen - Mastic a/w 08B	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-10A *131104441-0019*	Unit 28; Living Room - Fire Stop Putty	Red Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-10B *131104441-0020*	Unit 59; Living Room - Fire Stop Putty	Red Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-11A *131104441-0021*	Unit 28; Kitchen - 2x2 Ceiling Tile	Gray Fibrous Homogeneous	40% 40%	Cellulose Min. Wool	20%	Non-fibrous (other)	**None Detected**
091311-06-11B *131104441-0022*	Unit 40; Kitchen - 2x2 Ceiling Tile	Gray Fibrous Homogeneous	40% 40%	Cellulose Min. Wool	20%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-12A *131104441-0023*	2nd Fl ; Hallway; Utility Closet - HVAC Seam Sealant	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-12B *131104441-0024*	5th Fl ; Hallway; Utility Closet - HVAC Seam Sealant	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13A *131104441-0025*	Unit 29; Living Room (Soffit @ Window) - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13B *131104441-0026*	2nd Fl; Storage Room - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13C *131104441-0027*	Unit 40; Living Room @ Window - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-14A *131104441-0028*	Unit 29; Bathroom - 2x2 Ceiling Tile (Plaster)	Tan/White Fibrous Heterogeneous	10% 2%	Cellulose Glass	88%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-14B *131104441-0029*	Unit 40; Bathroom - 2x2 Ceiling Tile (Plaster)	Tan/White Fibrous Heterogeneous	10% 2%	Cellulose Glass	88%	Non-fibrous (other)	**None Detected**
091311-06-15A *131104441-0030*	2nd Fl; Storage Unit - 12x12 Floor Tile; Rose Color	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-15B *131104441-0031*	3rd Fl; Laundry Room - 12x12 Floor Tile; Rose Color	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-16A *131104441-0032*	2nd Fl; Storage Unit - Mastic a/w 15A	Black Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-16B *131104441-0033*	3rd Fl; Laundry Room - Mastic a/w 15B	Black Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-17A *131104441-0034*	2nd Fl; Storage Unit - Covebase Adhesive	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-17B *131104441-0035*	3rd Fl; Laundry Room - Covebase Adhesive	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-18A *131104441-0036*	3rd Fl; Employee Break Room - Carpet Mastic	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-18B *131104441-0037*	Unit 59; Living Room - Carpet Mastic	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-19A *131104441-0038*	1st Fl; Mechanical Room - End Cap Paint on Fiberglass Insulation	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-19B *131104441-0039*	1st Fl; Mechanical Room - End Cap Paint on Fiberglass Insulation	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

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Sample	Description	Appearance	Non-Asbestos %	Fibrous	Non-Asbestos %	Non-Fibrous	Asbestos %	Type
091311-06-20A *131104441-0040*	Exterior; East Side of Bldg - Damproofing under Brick Façade	Black Non-Fibrous Homogeneous			90%	Non-fibrous (other)	**10%**	**Chrysotile**
091311-06-20B *131104441-0041*	Exterior; East Side of Bldg - Damproofing under Brick Façade	Black Non-Fibrous Homogeneous			90%	Non-fibrous (other)	**10%**	**Chrysotile**
091311-06-21A *131104441-0042*	2nd Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	
091311-06-21B *131104441-0043*	3rd Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	
091311-06-21C *131104441-0044*	4th Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	

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THIS IS THE LAST PAGE OF THE REPORT.

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Your Name: Matthew Buccella **Project Manager:** Matt Buccella / Sean Hurley

Company: Axiom Partners, Inc.

Street: 979 MAIN STREET

City/State/Zip: Wakefield, Massachusetts 01880

Phone: 781.213.9198 **Fax:** 781.213.6992 **Email:** mbuccella@axiomenv.com

Project Name Naval Station Newport; Building 678 **Project #:**

Project Location: Newport, **Project State (US):** RI

TURNAROUND TIME

☐ Rush	☐ 6 Hours	☐ 12 Hours	☐ 24 Hours	☐ 48 Hours	■ 72 Hours	☐ 4 Days	☐ 5 Days	☐ 6-10 Days

SAMPLE MATRIX

☐ Air	■ Bulk	☐ Soil	☐ Wipe	☐ Micro-Vac	☐ Drinking Water	☐ Wastewater	☐ Chips	☐ Other

ASBESTOS ANALYSIS

PCM - Air
- ☐ NIOSH 7400 (A) Issue 2: August 1994
- ☐ OSHA w/TWA

TEM AIR
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402 Issue 2
- ☐ EPA Level II

PLM - Bulk
- 54 ■ EPA 600/R-93/116
- ☐ NY Stratified Point Count
- ☐ California Air Resource Board (CARB) 435
- ☐ NIOSH 9002
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ EPA Point Count (400 Points)
- ☐ EPA Point Count (1,000 Points)
- ☐ Standard Addition Point Count

SOILS
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram
- ☐ Superfund EPA 540-R097-028 (dust generation)

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP-1988-02
- ☐ TEM NOB (Gravimetric) NY 198.4

TEM MICROVAC
- ☐ ASTM D 5755-95 (Quantitative)

TEM WIPE
- ☐ ASTM D-6480-99
- ☐ Qualitative☐

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2
- ☐ Other:_____

LEAD ANALYSIS

Flame Atomic Absorption
- ☐ Wipe, SW846-7420☐ASTM ☐ non ASTM
- ☐ Soil, SW846-7420
- ☐ Air, NIOSH 7082
- ☐ Chips, SW846-7420 or AOAC 5.009 (974.02)
- ☐ Wastewater, SW 846-7420
- ☐ TCLP LEAD SW846-1311/7420

Graphite Furnace Atomic Absorption
- ☐ Air, NIOSH 7105
- ☐ Wastewater, SW846-7421
- ☐ Soil, SW846-7421
- ☐ Drinking Water, EPA 239.2

ICP – Inductively Coupled Plasma
- ☐Wipe, SW846-6010☐ASTM ☐ non ASTM
- ☐ Soil, SW846-6010
- ☐ Air, NIOSH 7300

MATERIALS ANALYSIS

- ☐ Full Particle Identification
- ☐ Optical Particle Identification
- ☐ Dust Mites and Insect Fragments
- ☐ Particle Size & Distribution
- ☐ Product Comparison
- ☐ Paint Characterizaton
- ☐ Failure Analysis
- ☐ Corrosion Analysis
- ☐ Glove Box Containment Study
- ☐ Petrographic Examination of Concrete
- ☐ Portland Cement in Workplace Atmospheres (OSHA ID-143)
- ☐ Man Made Vitrous Fibers – MMVF's
- ☐ Synthetic Fiber Identification
- ☐ Other:_____

MICROBIAL ANALYSIS

Air Samples
- ☐Mold & Fungi by Air O Cell
- ☐Mold & Fungi by Agar Plate count & id
- ☐Bacterial Count and Gram Stain
- ☐Bacterial Count and Identification

Water Samples
- ☐ Total Coliforms, Fecal Coliforms
- ☐ Escherichia Coli, Fecal Streptococcus
- ☐ Legionella
- ☐ Salmonella
- ☐ Giardia and Cryptosporidium

Wipe and Bulk Samples
- ☐ Mold & Fungi – Direct Examination
- ☐ Mold & Fungi – (Culture follow up to direct examination if necessary)
- ☐ Mold & Fungi – Culture (Count & ID)
- ☐ Mold & Fungi – Culture (Count only)
- ☐ Bacterial Count & Gram Stain
- ☐ Bacterial Count & Identification (3 most prominent types)
- ☐ Other:_____

IAQ ANALYSIS

- ☐ Nuisance Dust (NIOSH 0500 & 0600)
- ☐ Airborne Dust (PM10, TSP)
- ☐ Silica Analysis by XRD ☐Niosh 7500
- ☐ HVAC Efficiency
- ☐ Carbon Black
- ☐ Airborne Oil Mist
- ☐ Other:_____

Additional Information/Comments/Instructions:_____

Client Sample # (S) _____ **TOTAL SAMPLE #** 44

Relinquished:	Matthew Buccella	**Date:**	9-19-11	**Time:**
Received:	RECEIVED	**Date:**		**Time:**
Relinquished:		**Date:**		**Time:**
Received:	SEP 20 2011	**Date:**		**Time:**

BY: SA 1125 walkin

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(781) 933-8412 Fax	(203) 284-5978 Fax	(212) 290-0058 Fax	(856) 858-4960 Fax

	SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
1	091311-06-01A	Exterior; South Side of Building / Exterior Finish Insulation System (EFIS)	NA[1]	NA[1]
2	091311-06-01B	Exterior; East Side of Building / Exterior Finish Insulation System (EFIS)	NA[1]	NA[1]
3	091311-06-02A	Exterior; South Side of Building /EFIS Adhesive	NA[1]	NA[1]
4	091311-06-02B	Exterior; East Side of Building / EFIS Adhesive	NA[1]	NA[1]
5	091311-06-03A	Exterior; South Side of Building / Caulking @ Column (EFIS to Concrete)	NA[1]	NA[1]
6	091311-06-03B	Exterior; East Side of Building / Caulking @ Column (EFIS to Concrete)	NA[1]	NA[1]
7	091311-06-04A	Exterior; South Side of Building / Caulking @ Spandrel Beam (EFIS to Concrete)	NA[1]	NA[1]
8	091311-06-04B	Exterior; East Side of Building / Caulking @ Spandrel Beam (EFIS to Concrete)	NA[1]	NA[1]
9	091311-06-05A	Exterior; South Side of Building / Original Caulking (Brick to EFIS)	NA[1]	NA[1]
10	091311-06-05B	Exterior; East Side of Building / Original Caulking (Brick to EFIS)	NA[1]	NA[1]
11	091311-06-06A	Exterior; South Side of Building; First Floor / Original Window Caulking	NA[1]	NA[1]
12	091311-06-06B	Exterior; East Side of Building; First Floor / Original Window Caulking	NA[1]	NA[1]
13	091311-06-07A	Exterior; South Side of Building; Second Floor / Caulking; Brick to Concrete	NA[1]	NA[1]
14	091311-06-07B	Exterior; East Side of Building; Second Floor / Caulking; Brick to Concrete	NA[1]	NA[1]
15	091311-06-08A	Unit 27; Kitchen / Linoleum (Speckled)	NA[1]	NA[1]
16	091311-06-08B	Unit 27; Kitchen / Linoleum (Speckled)	NA[1]	NA[1]
17	091311-06-09A	Unit 27; Kitchen / Mastic Associated w/ Sample 08A	NA[1]	NA[1]
18	091311-06-09B	Unit 59; Kitchen / Mastic Associated w/ Sample 08B	NA[1]	NA[1]
19	091311-06-10A	Unit 28; Living Room / Fire Stop Putty	NA[1]	NA[1]
20	091311-06-10B	Unit 59; Living Room / Fire Stop Putty	NA[1]	NA[1]
21	091311-06-11A	Unit 28; Kitchen / 2' x 2' Ceiling Tile	NA[1]	NA[1]
22	091311-06-11B	Unit 40; Kitchen / 2' x 2' Ceiling Tile	NA[1]	NA[1]
23	091311-06-12A	Second Floor; Hallway; Utility Closet / HVAC Seam Sealant	NA[1]	NA[1]
24	091311-06-12B	Fifth Floor; Hallway; Utility Closet / HVAC Seam Sealant	NA[1]	NA[1]
25	091311-06-13A	Unit 29; Living Room (Soffit @ Window) / Joint Compound	NA[1]	NA[1]
26	091311-06-13B	Second Floor; Storage Room / Joint Compound	NA[1]	NA[1]
27	091311-06-13C	Unit 40; Living Room (@ Window) / Joint Compound	NA[1]	NA[1]
28	091311-06-14A	Unit 29; Bathroom / 2' x 2' Ceiling Tile (Plaster)	NA[1]	NA[1]
29	091311-06-14B	Unit 40; Bathroom / 2' x 2' Ceiling Tile (Plaster)	NA[1]	NA[1]

Relinquished:	**Matthew Buccella**	**Date:**	**9-16-11**	**Time:**	
Received:	RECEIVED	**Date:**		**Time:**	
Relinquished:		**Date:**		**Time:**	
Received:	SEP 20 2011	**Date:**		**Time:**	
	BY: SA 1125				

[1] Not Applicable

131104441

131104441

EMSL

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7 Constitution Way, Suite 107	4 Fairfield Blvd.	307 West 38th Street	107 Haddon Avenue
Woburn, MA 01801	Wallingford, CT 06492	New York, NY 10018	Westmont, NJ 08108
(781) 933-8411	(203) 284-5948	(866) 448-3675	(800) 220-3675
(781) 933-8412 Fax	(203) 284-5978 Fax	(212) 290-0058 Fax	(856) 858-4960 Fax

	SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
30	091311-06-15A	Second Floor; Storage Unit / 12" x 12" Floor Tile (Rose Color)	NA[1]	NA[1]
31	091311-06-15B	Third Floor; Laundry Room / 12" x 12" Floor Tile (Rose Color)	NA[1]	NA[1]
32	091311-06-16A	Second Floor; Storage Unit / Mastic Associated w/ Sample 15A	NA[1]	NA[1]
33	091311-06-16B	Third Floor; Laundry Room / Mastic Associated w/ Sample 15B	NA[1]	NA[1]
34	091311-06-17A	Second Floor; Storage Unit / Covebase Adhesive	NA[1]	NA[1]
35	091311-06-17B	Third Floor; Laundry Room / Covebase Adhesive	NA[1]	NA[1]
36	091311-06-18A	Third Floor; Employee Break Room / Carpet Mastic	NA[1]	NA[1]
37	091311-06-18B	Unit 59; Living Room / Carpet Mastic	NA[1]	NA[1]
38	091311-06-19A	First Floor; Mechanical Room / End Cap Paint (On Fiberglass Insulation)	NA[1]	NA[1]
39	091311-06-19B	First Floor; Mechanical Room / End Cap Paint (On Fiberglass Insulation)	NA[1]	NA[1]
40	091311-06-20A	Exterior; East Side of Building / Damp Proofing (Under Brick Façade)	NA[1]	NA[1]
41	091311-06-20B	Exterior; East Side of Building / Damp Proofing (Under Brick Façade)	NA[1]	NA[1]
42	091311-06-21A	Second Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]
43	091311-06-21B	Third Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]
44	091311-06-21C	Fourth Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]

Relinquished:	**Matthew Buccella**	**Date:**	**9-19-11**	**Time:**	
Received:		**Date:**		**Time:**	
Relinquished:	RECEIVED	**Date:**		**Time:**	
Received:	SEP 20 2011	**Date:**		**Time:**	

BY: SQ 1125

[1] Not Applicable

APPENDIX B

Lead Containing Paint Bulk Sample
Laboratory Analysis Report & XRF Form

EMSL Analytical, Inc.
3 Cooper St., Westmont, NJ 08108
Phone: (856) 858-4800 Fax: (856) 858-9551 Email: westmontleadlab@emsl.com

Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198

Project: **Naval Station Newport; Colbert Plaza; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/21/11 10:14 AM
EMSL Order: 201111412

EMSL Proj:

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
LBP-01	*0001*		9/23/2011	<0.011 % wt
	Site: Unit 20; Closet Wall Paint; Beige			

Initial report from 09/23/2011 13:51:50

Julie Smith - Laboratory Director
NJ-NELAP Accredited:04653
or other approved signatory

Reporting limit is 0.01 % wt. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected . This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc. Westmont, NJ NELAP Certifications: NJ 04653, NY 10896, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

201111412

201111412

EMSL – MA	EMSL – CT	EMSL – NY	EMSL – NJ
7 Constitution Way, Suite 107 Woburn, MA 01801 (781) 933-8411 (781) 933-8412 Fax	4 Fairfield Blvd. Wallingford, CT 06492 (203) 284-5948 (203) 284-5978 Fax	307 West 38th Street New York, NY 10018 (866) 448-3675 (212) 290-0058 Fax	107 Haddon Avenue Westmont, NJ 08108 (800) 220-3675 (856) 858-4960 Fax

www.emsl.com

Your Name: Matthew Buccella **Project Manager:** Matt Buccella / Sean Hurley

Company: Axiom Partners, Inc.

Street: 979 MAIN STREET

City/State/Zip: Wakefield, Massachusetts 01880

Phone: 781.213.9198 **Fax:** 781.213.6992 **Email:** mbuccella@axiomenv.com

Project Name Naval Station Newport; Colbert Plaza **Project #:**

Project Location: Newport, **Project State (US):** RI

TURNAROUND TIME

☐ Rush	☐ 6 Hours	☐ 12 Hours	☐ 24 Hours	☐ 48 Hours	■ 3 Days	☐ 4 Days	☐ 5 Days	☐ 6-10 Days

SAMPLE MATRIX

☐ Air	■ Bulk	☐ Soil	☐ Wipe	☐ Micro-Vac	☐ Drinking Water	☐ Wastewater	☐ Chips	☐ Other

ASBESTOS ANALYSIS

PCM - Air
- ☐ NIOSH 7400 (A) Issue 2: August 1994
- ☐ OSHA w/TWA

TEM AIR
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402 Issue 2
- ☐ EPA Level II

PLM - Bulk
EPA 600/R-93/116
- ☐ NY Stratified Point Count
- ☐ California Air Resource Board (CARB) 435
- ☐ NIOSH 9002
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ EPA Point Count (400 Points)
- ☐ EPA Point Count (1,000 Points)
- ☐ Standard Addition Point Count

SOILS
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram
- ☐ Superfund EPA 540-R097-028 (dust generation)

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP-1988-02
- ☐ TEM NOB (Gravimetric) NY 198.4

TEM MICROVAC
- ☐ ASTM D 5755-95 (Quantitative)

TEM WIPE
- ☐ ASTM D-6480-99
- ☐ Qualitative☐

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2
- ☐ Other:_____

LEAD ANALYSIS

Flame Atomic Absorption
- ☐ Wipe, SW846-7420☐ASTM ☐ non ASTM
- ☐ Soil, SW846-7420
- ☐ Air, NIOSH 7082
- ■ Chips, SW846-7420 or AOAC 5.009 (974.02)
- ☐ Wastewater, SW 846-7420
- ☐ TCLP LEAD SW846-1311/7420

Graphite Furnace Atomic Absorption
- ☐ Air, NIOSH 7105
- ☐ Wastewater, SW846-7421
- ☐ Soil, SW846-7421
- ☐ Drinking Water, EPA 239.2

ICP – Inductively Coupled Plasma
- ☐Wipe, SW846-6010☐ASTM ☐ non ASTM
- ☐ Soil, SW846-6010
- ☐ Air, NIOSH 7300

MATERIALS ANALYSIS

- ☐ Full Particle Identification
- ☐ Optical Particle Identification
- ☐ Dust Mites and Insect Fragments
- ☐ Particle Size & Distribution
- ☐ Product Comparison
- ☐ Paint Characterizaton
- ☐ Failure Analysis
- ☐ Corrosion Analysis
- ☐ Glove Box Containment Study
- ☐ Petrographic Examination of Concrete
- ☐ Portland Cement in Workplace Atmospheres (OSHA ID-143)
- ☐ Man Made Vitrous Fibers – MMVF's
- ☐ Synthetic Fiber Identification
- ☐ Other:_____

MICROBIAL ANALYSIS

Air Samples
- ☐Mold & Fungi by Air O Cell
- ☐Mold & Fungi by Agar Plate count & id
- ☐Bacterial Count and Gram Stain
- ☐*Bacterial Count and Identification*

Water Samples
- ☐ Total Coliforms, Fecal Coliforms
- ☐ Escherichia Coli, Fecal Streptococcus
- ☐ Legionella
- ☐ Salmonella
- ☐ Giardia and Cryptosporidium

Wipe and Bulk Samples
- ☐ Mold & Fungi – Direct Examination
- ☐ Mold & Fungi – (Culture follow up to direct examination if necessary)
- ☐ Mold & Fungi – Culture (Count & ID)
- ☐ Mold & Fungi – Culture (Count only)
- ☐ Bacterial Count & Gram Stain
- ☐ Bacterial Count & Identification (3 most prominent types)
- ☐ Other:_____

IAQ ANALYSIS

- ☐ Nuisance Dust (NIOSH 0500 & 0600)
- ☐ Airborne Dust (PM10, TSP)
- ☐ Silica Analysis by XRD ☐Niosh 7500
- ☐ HVAC Efficiency
- ☐ Carbon Black
- ☐ Airborne Oil Mist
- ☐ Other:_____

Additional Information/Comments/Instructions:_____

Client Sample # (S) _____ **TOTAL SAMPLE #** _____

Relinquished:	Matthew Buccella	**Date:** 9-20-11	**Time:**
Received:	RECEIVED	**Date:**	**Time:**
Relinquished:	SEP 20 2011	**Date:**	**Time:**
Received:	BY: SA 1125 walkin	**Date:**	**Time:**

Rec'd Walkin 9/21/11 AM

11 SEP 21 AM 10:14
LEGEND
WESTMONT, N.J.

201111412

201111412

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SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
LBP-01	Unit 20; Closet Wall Paint; Beige	NA[1]	NA[1]

Relinquished: Matthew Buccella **Date:** 9-20-11 **Time:**

Received: **Date:** **Time:**

RECEIVED
SEP 20 2011
BY: SA 1125

RECEIVED
EMSL
WESTMONT, N.J.
11 SEP 21 AM 10: 14

[1] Not Applicable

APPENDIX C

Hazardous Building Materials Inventories
(Chlorofluorocarbons)
(Mercury Containing Equipment)
(Fluorescent Bulbs & Ballasts)

HBM INVENTORY
Naval Station Newport – Building #678
Newport, Rhode Island
September 2011

Fluorescent Light Bulbs & Ballasts

Description	Qty	Location	Mfg./Model
Compact Fluorescent Bulb Fixture	~60	Throughout Hallways	Advance Cat. No. VS-25110-2-TP
Four Foot Bulb Fixture	~175	Throughout Hallways & Kitchens	Advance Cat. No. VS-25110-2-TP

Mercury-Containing Thermostats and Thermometers

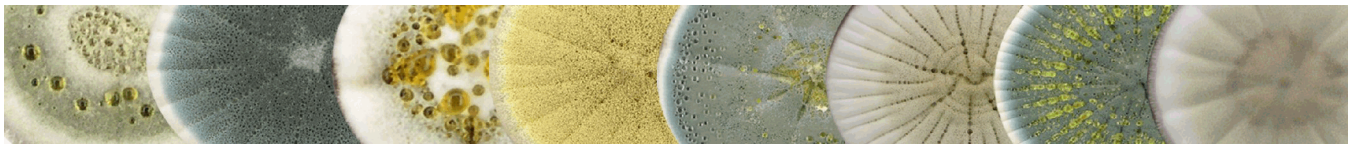
Location	Manufacturer	Number of Units
Not Applicable (NA)	NA	NA

Chlorofluorocarbons

Locations	Equipment	Quantity
Throughout Kitchens	Refrigerator	1 (per unit)
Roof Top	Large Unit	Unkown

APPENDIX D

Mold Air Sampling Laboratory Report
With Extended Fungal Summary

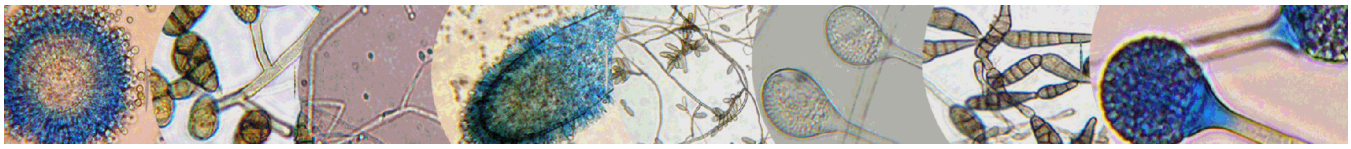


EXPANDED FUNGAL REPORT ®

Prepared Exclusively For

Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

Report Date:	**9/28/2011**
Project:	**Naval Station Newport; Building 678; Newport, RI**
EMSL Order:	**131104523**



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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

1. Description of Analysis

Analytical Laboratory
EMSL Analytical, Inc. (EMSL) is a nationwide, full service, analytical testing laboratory network providing Asbestos, Mold, Indoor Air Quality, Microbiological, Environmental, Chemical, Forensic, Materials, Industrial Hygiene and Mechanical Testing services since 1981. Ranked as the premier independently owned environmental testing laboratory in the nation, EMSL puts analytical quality as its top priority. This quality is recognized by many well-respected federal, state and private accrediting agencies, such as AIHA's EMLAP and EMPAT programs, and assured by our high quality personnel, including many Ph.D. microbiologists and mycologists.

EMSL is an independent laboratory that performed the analysis of these samples. EMSL did not conduct the sampling or site investigation for this report. The samples referenced herein were analyzed under strict quality control procedures using state-of-the-art microbiological methods. The analytical methods used and the data presented are scientifically and legally defensible.

The laboratory data is provided in compliance with AIHA policy modules and ISO 17025 guidelines for the particular test(s) requested, including any associated limitations for the methods employed. These data are intended for use by professionals having knowledge of the testing methods necessary to interpret them accurately.

Air Samples - Spore traps:
Spore traps are commercially available sampling devices that capture airborne particles on an adhesive slide. Air is pulled through the device using a vacuum pump. Spores, as well as other airborne particles, are impacted on the collection adhesive. Using spore trap collection methods has inherent limitations. These collection methods are biased towards larger spore sizes.

The analysis for total spore counts is a direct microscopic examination and does not include culturing or growing the fungi. Therefore, the results include both viable and non-viable spores. Some fungal groups produce similar spore types that cannot be distinguished by direct microscopic examination alone (i.e., *Aspergillus/Penicillium*, and others). Other spore types may lack distinguishing features that aid in their identification. These types are grouped into larger categories such as Ascospores or Basidiospores.

Fungal spores are identified and grouped by morphological characteristics including color, shape, septation, ornamentation, and fruiting structures (if present) which are compared to published mycological identification keys and texts. EMSL reports provide spore counts per cubic meter of air to three significant figures. Please note that each spore category is reported to three significant figures. Due to rounding and the application of three significant

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figures the sum of the individual spore numbers may not equal the total spore count on the report. EMSL does not maintain responsibility for final volume concentrations (counts/m3) since this volume is provided by the field collector and can not be verified by EMSL.

EMSL analyzes spore traps using phase contrast microscopy. There is a wide choice of collection devices (Air-O-Cell, Micro-5, Burkhard, etc.) on the market. Differences in analytical method may exist between spore trap devices.

Spore trap results are reported in spores per cubic meter of air. Due to the other airborne particles collected with the spores, EMSL reports a background particle density. Background density is an indication of overall particulate matter present on the sample (i.e. dust in the air). High background concentrations may obscure spores such as the *Penicillium*/*Aspergillus* group. The rating system is from 1-5 with 1 = 1 - 25% of the background obscured by material, 2 = 26 - 50%, 3 = 51 - 75%, 4 = 76% - 99%, 5 = 100% or overloaded. A background rating of 4 or higher should be regarded as a minimum count since the actual concentrations may be higher than those reported. EMSL will not be held responsible for overloading of samples. Sample volumes are left to the discretion of the company or persons conducting the fieldwork.

Skin fragment density is the percentage of skin cells making up the total background material, 1 = 1 - 25%, 2 = 26 - 50%, 3 = 51 - 75%, 4 = 76-100%. Skin fragment density is considered an indication of the general cleanliness in the area sampled. It has been estimated that up to 90% of household dust consists of dead skin cells.

2. Analytical Results

See attached data reports and charts.

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Phone: (781) 933-8411 Fax: (781) 933-8412 Web: Email:bostonlab@emsl.com

Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0001
Client Sample ID: 746551
Location: Bldg 678; Unit 20 @ Window
Sample Volume (L): 120
Sample Type: Inside
Comments:

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	None Detected	27	Less than Background
Ascospores	None Detected	None Detected	Equal To Background
Aspergillus/Penicillium	405	None Detected	405
Basidiospores	405	1220	Less than Background
Bipolaris++	None Detected	None Detected	Equal To Background
Chaetomium	None Detected	None Detected	Equal To Background
Cladosporium	459	1320	Less than Background
Curvularia	None Detected	27	Less than Background
Epicoccum	None Detected	None Detected	Equal To Background
Fusarium	None Detected	None Detected	Equal To Background
Ganoderma	None Detected	81	Less than Background
Myxomycetes++	None Detected	None Detected	Equal To Background
Pithomyces	81	27	54
Rust	None Detected	None Detected	Equal To Background
Scopulariopsis	None Detected	None Detected	Equal To Background
Smut	None Detected	27	Less than Background
Stachybotrys	None Detected	None Detected	Equal To Background
Torula	None Detected	None Detected	Equal To Background
Ulocladium	None Detected	None Detected	Equal To Background
Unidentifiable Spores	None Detected	None Detected	Equal To Background
Zygomycetes	None Detected	None Detected	Equal To Background
Total Fungi	**1350**	**2730**	**Less than Background**
Hyphal Fragment	27	None Detected	27
Insect Fragment	None Detected	None Detected	Equal To Background
Pollen	None Detected	None Detected	Equal To Background

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	2	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless othewise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" denotes not detected. EMSL maintains liability limited to cost of anaysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Renaldo Drakes, Laboratory Manager
or other Approved Signatory

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Phone: (781) 933-8411 Fax: (781) 933-8412 Web: Email:bostonlab@emsl.com

Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0002
Client Sample ID: 001331
Location: Bldg 678; 2nd Fl; Laundry Rm
Sample Volume (L): 120
Sample Type: Inside
Comments:

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	27	27	Equal To Background
Ascospores	None Detected	None Detected	Equal To Background
Aspergillus/Penicillium	54	None Detected	54
Basidiospores	81	1220	Less than Background
Bipolaris++	None Detected	None Detected	Equal To Background
Chaetomium	None Detected	None Detected	Equal To Background
Cladosporium	270	1320	Less than Background
Curvularia	27	27	Equal To Background
Epicoccum	None Detected	None Detected	Equal To Background
Fusarium	None Detected	None Detected	Equal To Background
Ganoderma	None Detected	81	Less than Background
Myxomycetes++	None Detected	None Detected	Equal To Background
Pithomyces	27	27	Equal To Background
Rust	None Detected	None Detected	Equal To Background
Scopulariopsis	None Detected	None Detected	Equal To Background
Smut	27	27	Equal To Background
Stachybotrys	None Detected	None Detected	Equal To Background
Torula	None Detected	None Detected	Equal To Background
Ulocladium	None Detected	None Detected	Equal To Background
Unidentifiable Spores	54	None Detected	54
Zygomycetes	None Detected	None Detected	Equal To Background
Total Fungi	**567**	**2730**	**Less than Background**
Hyphal Fragment	None Detected	None Detected	Equal To Background
Insect Fragment	None Detected	None Detected	Equal To Background
Pollen	27	None Detected	27

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	2	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless othewise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" denotes not detected. EMSL maintains liability limited to cost of anaysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Renaldo Drakes, Laboratory Manager
or other Approved Signatory

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0003
Client Sample ID: 001347
Location: Exterior; Courtyard
Sample Volume (L): 120
Sample Type: Background
Comments

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	27	27	N/A
Ascospores	None Detected	None Detected	N/A
Aspergillus/Penicillium	None Detected	None Detected	N/A
Basidiospores	1220	1220	N/A
Bipolaris++	None Detected	None Detected	N/A
Chaetomium	None Detected	None Detected	N/A
Cladosporium	1320	1320	N/A
Curvularia	27	27	N/A
Epicoccum	None Detected	None Detected	N/A
Fusarium	None Detected	None Detected	N/A
Ganoderma	81	81	N/A
Myxomycetes++	None Detected	None Detected	N/A
Pithomyces	27	27	N/A
Rust	None Detected	None Detected	N/A
Scopulariopsis	None Detected	None Detected	N/A
Smut	27	27	N/A
Stachybotrys	None Detected	None Detected	N/A
Torula	None Detected	None Detected	N/A
Ulocladium	None Detected	None Detected	N/A
Unidentifiable Spores	None Detected	None Detected	N/A
Zygomycetes	None Detected	None Detected	N/A
Total Fungi	**2730**	**2730**	**N/A**
Hyphal Fragment	None Detected	None Detected	N/A
Insect Fragment	None Detected	None Detected	N/A
Pollen	None Detected	None Detected	N/A

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	1	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

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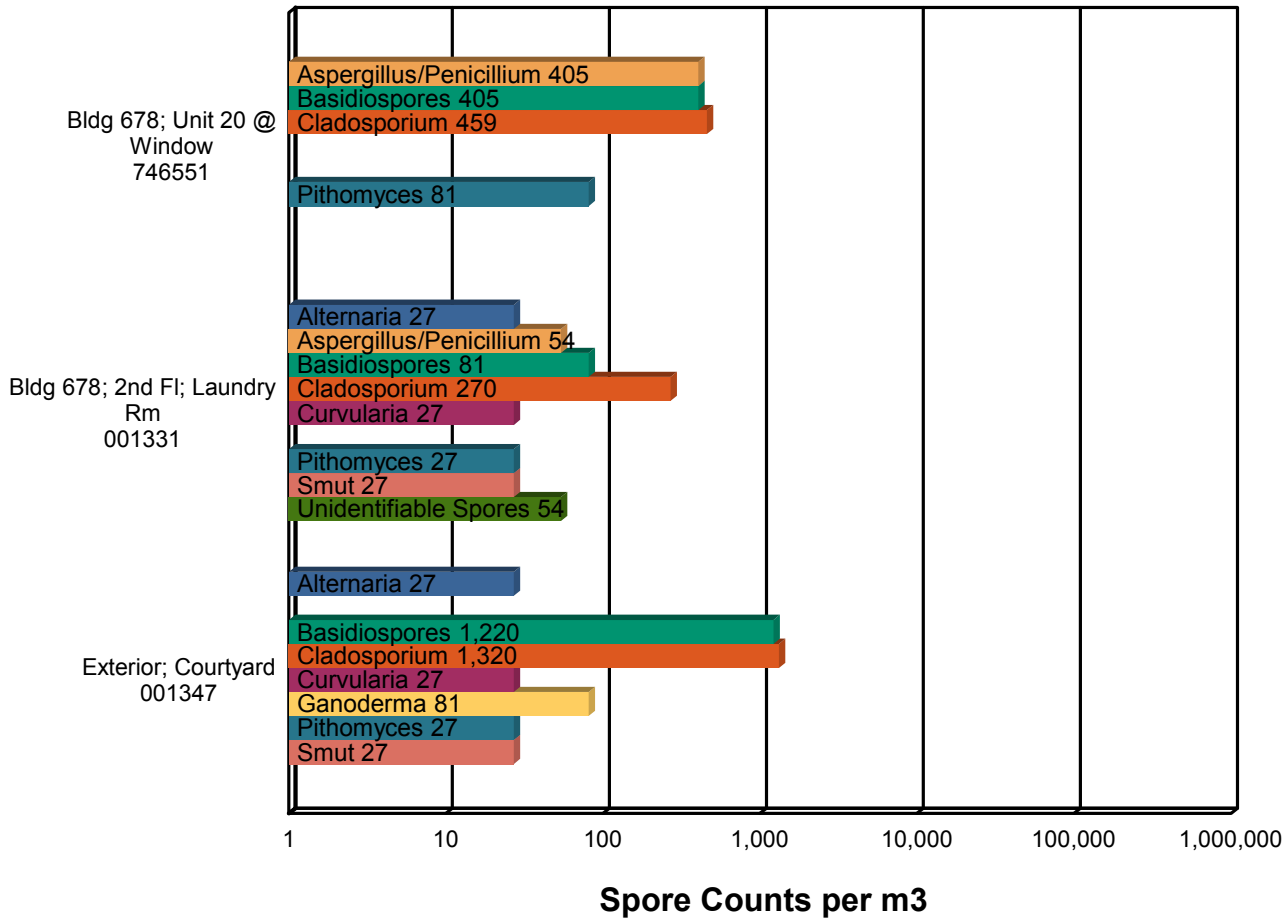
Spore Trap Report: Total Counts



Alternaria	Aspergillus/Penicillium	Basidiospores	Cladosporium
Curvularia	Ganoderma	Pithomyces	Smut
Unidentifiable Spores			

* The chart is displayed using a logarithmic scale. Bar size is not directly proportional to the number of spores.

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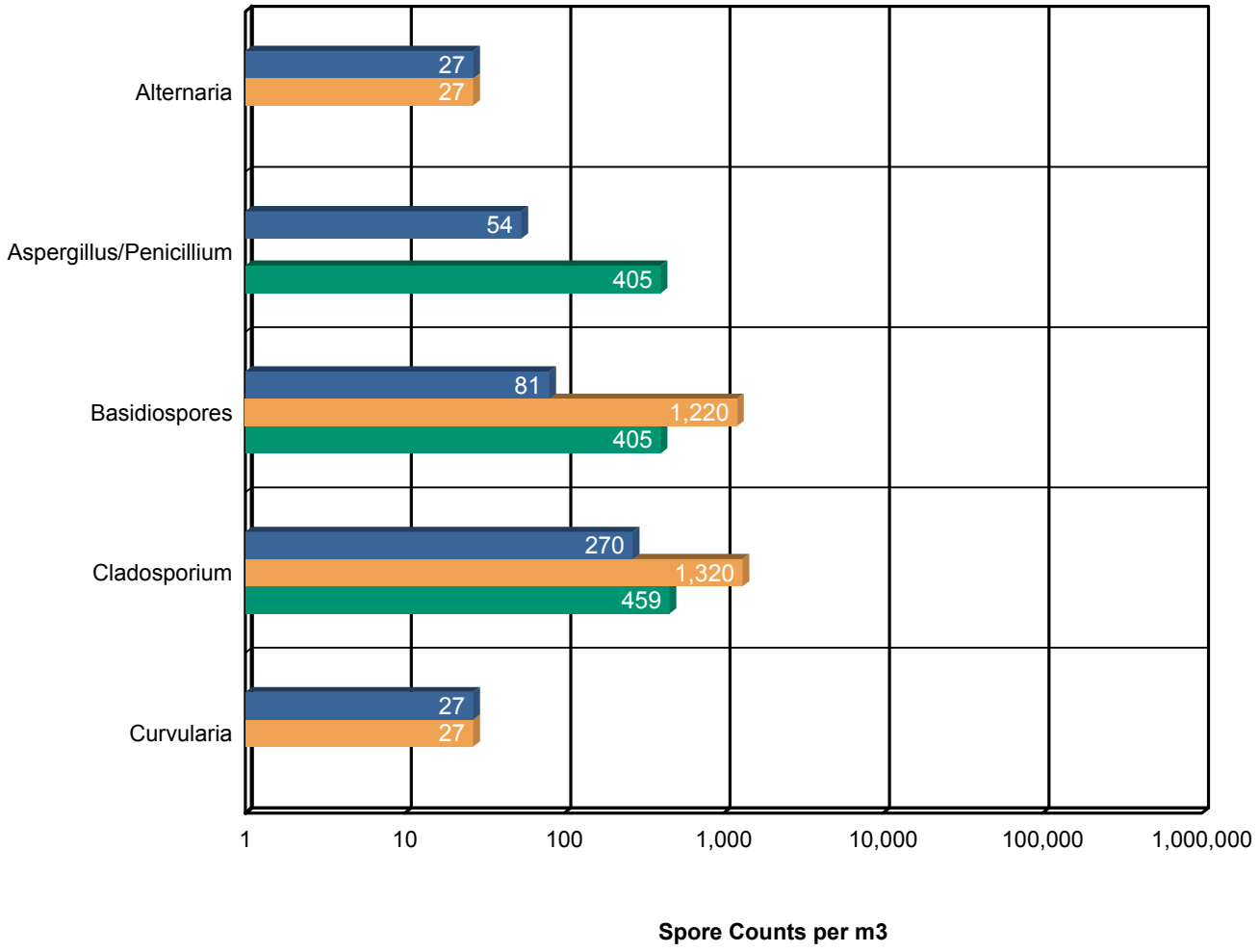
Background Comparison Chart



* The chart is displayed using a logarithmic scale. The bar size is not directly proportional to the number of spores.

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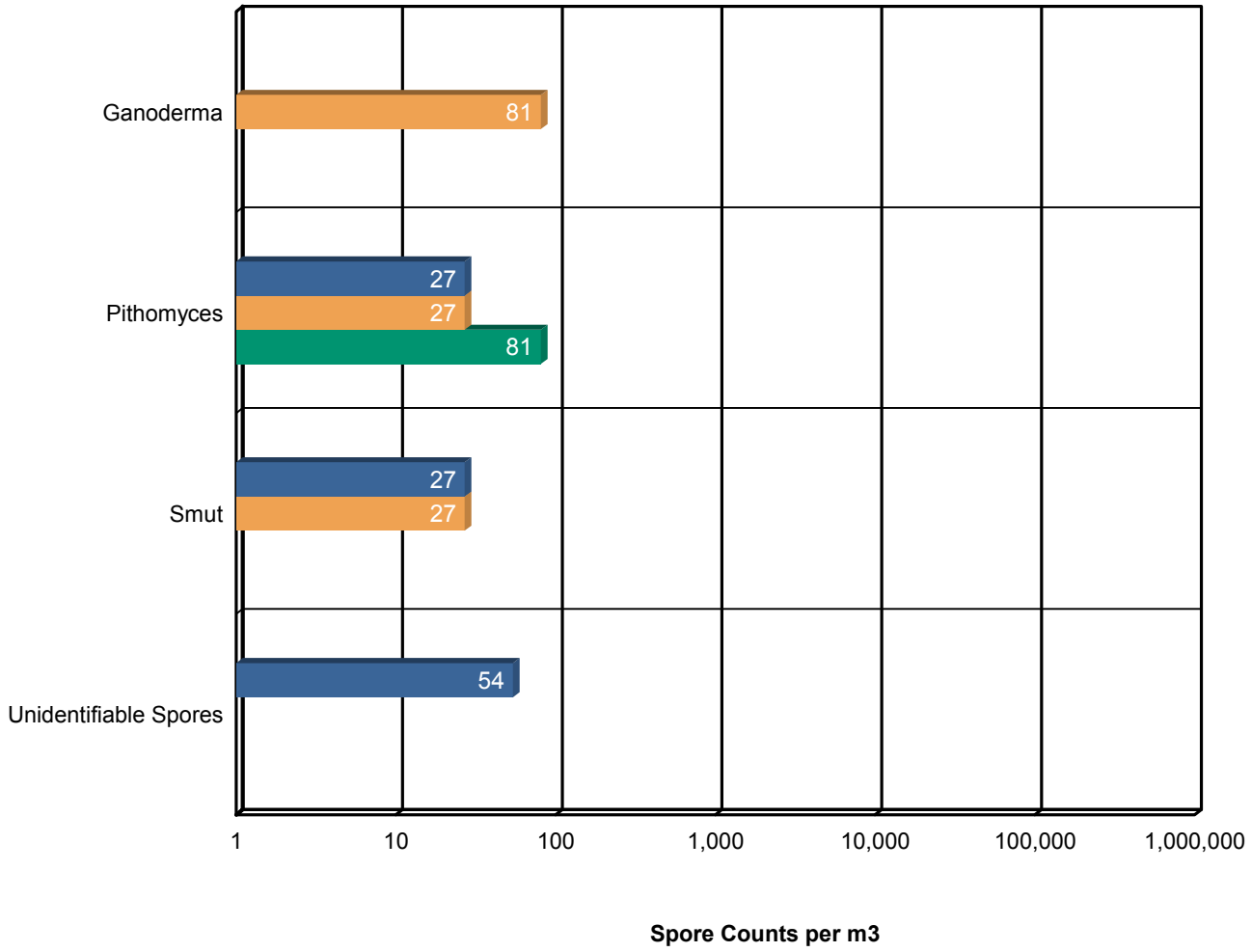
Background Comparison Chart



* The chart is displayed using a logarithmic scale. The bar size is not directly proportional to the number of spores.

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3. Understanding the Results

EMSL Analytical, Inc. is an independent laboratory, providing unbiased and scientifically valid results. These data represent only a portion of an overall IAQ investigation. Visual information and environmental conditions measured during the site assessment (humidity, moisture readings, etc.) are crucial to any final interpretation of the results. Many factors impact the final results; therefore, result interpretation should only be conducted by qualified individuals. The American Conference of Governmental Industrial Hygienists (ACGIH) has published a good reference book covering sampling and data interpretation. It is entitled, Bioaerosols: Assessment and Control, 1999.

Air Samples:
Air samples are typically evaluated by means of fungal type identified and by comparing indoor and outdoor concentrations, complaint to non-complaint areas, or area of concern to areas of non-concern. In general, the levels and types of fungi in the indoor air (in non-problem buildings) should be similar to or lower than those found in the outdoor air. Higher levels of spores (order of magnitude) found inside may indicate that moisture sources and resultant fungal growth are present. Spore count results are influenced by geographic location, seasonal and diurnal variation, and biotic/abiotic outside conditions. For example, fresh snow cover on the ground will affect the outdoor spore count concentration.

Use the following guidelines when interpreting the results:

1. The composition and diversity of fungi in indoor, non-problem buildings should be similar to that of the outdoor air.
2. Compare spore count concentrations indoors and outdoors. Elevated indoor concentrations may indicate indoor fungal growth. Be aware that this is not always consistent and additional sampling may be needed.
3. Certain fungi are very good indicators of water damage. The presence of these spores, even in small quantities, indicates the presence of water damage. These indicator fungi include, but are not limited to, *Chaetomium, Fusarium, Stachybotrys* (including *Memnoniella*), and *Ulocladium*.
4. Different types of fungi grow at different levels of biologically available water. These differences in fungal growth suggest the degree of water damage or saturation. For example, *Stachybotrys* is an indication of short term, severe, or prolonged water damage over time.

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Fungal spores are found everywhere. Whether or not symptoms develop in people exposed to fungi depends on the nature of the fungal material (e.g., allergenic, toxic, or infectious), the exposure level, and the susceptibility of exposed persons. Susceptibility varies with the genetic predisposition (e.g., allergic reactions do not always occur in all individuals), age, pre-existing medical conditions (e.g., diabetes, cancer, or chronic lung conditions), use of immunosuppressive drugs, and concurrent exposures. These reasons make it difficult to identify dose/response relationships that are required to establish “safe” or “unsafe” levels (i.e., permissible exposure limits).

It is generally accepted in the industry that indoor fungal growth is undesirable and inappropriate, necessitating removal or other appropriate remedial actions. The New York City guidelines and EPA guidelines for mold remediation in schools and commercial buildings define the conditions warranting mold remediation. Always remember that water is the key. Preventing water damage or water condensation will prevent mold growth.

This report is not intended to provide medical advice or advice concerning the relative safety of an occupied space. Always consult an occupational or environmental health physician who has experience addressing indoor air contaminants if you have any questions.

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4. Glossary of Fungi

ALTERNARIA	
Natural Habitat	Common saprobe and pathogen of plants. Typically found on plant tissue, decaying wood, and foods. Soil . Air outdoors.
Suitable Substrates in the Indoor Environment	Indoors near condensation (window frames, showers). House dust (in carpets, and air) Also colonizes building supplies, computer disks, cosmetics, leather, optical instruments, paper, sewage, stone monuments, textiles, wood pulp, and jet fuel
Water Activity	Aw =0.85-0.88
Mode of Dissemination	Wind
Allergic Potential	Type I allergies (hay fever, asthma), Type III (hypersensitivity pneumonitis)
Potential or Opportunistic Pathogens	Phaeohyphomycosis {causing cystic granulomas in the skin and subcutaneous tissue}. In immunocompetent patients, Alternaria colonizes the paranasal sinuses, leading to chronic hypertrophic sinusitis
Industrial Uses	Biocontrol of weed plants ·Biocontrol fungal plant pathogens.
Potential Toxins Produced	Alternariol (AOH) . Alternariol monomethylether (AME). Tenuazonic acid (TeA). Altenuene (ALT). Altertoxins (ATX)
Other Comments	Alternaria spores are one of the most common and potent indoor and outdoor airborne allergens. Additionally, Alternaria sensitization has been determined to be one of the most important factors in the onset of childhood asthma. Synergy with Cladosporium or Ulocladium may increase the severity of symptoms

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ASPERGILLUS/PENICILLIUM

Natural Habitat	·Plant debris ·Seed ·Cereal crops
Suitable Substrates in the Indoor Environment	Grows on a wide range of substrates indoors ·Prevalent in water damaged buildings ·Foods (blue mold on cereals, fruits, vegetables, dried foods) ·House dust ·Fabrics ·Leather ·Wallpaper ·Wallpaper glue
Water Activity	Aw=0.75-0.94
Mode of Dissemination	Wind ·Insects
Allergic Potential	Type I (hay fever, asthma) ·Type III (hypersensitivity)
Potential or Opportunistic Pathogens	Possible depending on the species.
Industrial Uses	Many depending on the species
Potential Toxins Produced	Possible depending on the species.
Other Comments	Spores of Aspergillus and Penicillium (including others such as Acremonium and Paecilomyces) are small and spherical with few distinguishing characteristics. They cannot be differentiated or speciated by non-viable impaction sampling methods. Some species with very small spores may be undercounted in samples with high background debris.

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BASIDIOSPORES

Natural Habitat	Forest floors. Lawns .Plants (saprobes or pathogens depending on genus)
Suitable Substrates in the Indoor Environment	Depends on genus. Wood products
Water Activity	Unknown.
Mode of Dissemination	Forcible ejection. Wind currents.
Allergic Potential	Type I allergies (hay fever, asthma) . Type III (hypersensitivity pneumonitis)
Potential or Opportunistic Pathogens	Depends on genus.
Industrial Uses	Edible mushrooms are used in the food industry.
Potential Toxins Produced	Amanitins. monomethyl-hydrazine. muscarine. ibotenic acid. psilocybin.
Other Comments	Basidiospores are the result of sexual reproduction and formed on a structure called the basidium. Basidiospores belong to the members of the Phylum Basidiomycota, which includes mushrooms, shelf fungi, rusts, and smuts.

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CLADOSPORIUM	
Natural Habitat	Dead plant matter. Straw. Soil. Woody plants
Suitable Substrates in the Indoor Environment	Fiberglass duct liner. Paint. Textiles. Found in high concentration in water-damaged building materials.
Water Activity	Aw 0.84-0.88
Mode of Dissemination	Air
Allergic Potential	Type I (asthma and hay fever).
Potential or Opportunistic Pathogens	Edema. keratitis. onychomycosis. pulmonary infections. Sinusitis.
Industrial Uses	Produces 10 antigens.
Potential Toxins Produced	Cladosporin and Emodin.

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GANODERMA

Natural Habitat	Grows on conifers and hardwoods worldwide, causing white rot, root rot, and stem rot.
Suitable Substrates in the Indoor Environment	Unknown.
Water Activity	Unknown.
Mode of Dissemination	Wind.
Allergic Potential	Ganoderma species are known to cause allergies in people on a worldwide scale.
Potential or Opportunistic Pathogens	Unknown.
Industrial Uses	Biopulping of wood for the paper industry. Potential medicinal use due to: 1. Inhibition of Ras dependent cell transformation, 2. Antifibrotic activity, 3. Immunomodulating activity, 4. Free-radicle scavenging
Potential Toxins Produced	Unknown.
Other Comments	Used in traditional Chinese medicine as an herbal supplement. It is also known as a "shelf fungus" because the fruiting body forms a stalk-less shelf on the sides of trees and logs. It is sometimes called “artists conk” because when you scratch the white pores of the fruiting body, the white rubs away and exposes the brown hyphae underneath. Thus, pictures can be produced on the fruiting body.
Reference	References: Craig, R.L., Levetin, E. 2000. Multi-year study of Ganoderma aerobiology. Aerobiologia 16: 75-81. http://www.pfc.forestry.ca/diseases/CTD/Group/Heart/heart6_e.html

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PITHOMYCES	
Natural Habitat	A worldwide saprophytic fungi, being isolated from dead plant material and soil.
Suitable Substrates in the Indoor Environment	Paper
Water Activity	Requires high moisture for spore germination
Mode of Dissemination	Wind
Allergic Potential	Unknown
Potential or Opportunistic Pathogens	Mycosis in immunocompromised patients
Industrial Uses	
Potential Toxins Produced	
Other Comments	
Reference	

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5. References and Informational Links

Books

- Bioaerosols: Assessment and Control. Janet Macher, Ed., American Conference of Governmental Industrial Hygienists, Cincinnati, OH 1999.
- Exposure Guidelines for Residential Indoor Air Quality. Environmental Health Directorate, Health Protection Branch, Health Canada, Ottawa, Ontario, 1989.
- Fungal Contamination in Public Buildings: Health Effects and Investigation Methods. Health Canada, Ottawa, Ontario, 2004.
- IICRC: S500 Standard and Reference Guide for Professional Water Damage Restoration. 3rd Edition, Institute of Inspection, Cleaning, and Restoration Certification, Vancouver, WA, 2006
- IICRC: S520 Standard and Reference Guide for Professional Mold Remediation. 1st Edition, Institute of Inspection, Cleaning, and Restoration Certification, Vancouver, WA, 2004
- Field Guide for the Determination of Biological Contaminants in Environmental Samples. 2nd Edition, American Industrial Hygiene Association, 2005.

Consumer Links

- Read the full text of AIHA's "The Facts About Mold" consumer brochure.
  http://www.aiha.org/news-pubs/newsroom/Documents/Facts%20about%20mold.pdf
- The Occupational Safety and Health Administration (OSHA)
  http://www.osha.gov/SLTC/molds/index.html
- CDC Mold Facts
  http://www.cdc.gov/mold/faqs.htm
- CDC Stachybotrys - Questions and answers on Stachybotrys chartarum and other molds
  http://www.cdc.gov/mold/stachy.htm
- IOM, NAS: Clearing the Air: Asthma and Indoor Air Exposures
  http://fermat.nap.edu/books/0309064961/html/index.html
- National Library of Medicine-Mold website
  http://www.nlm.nih.gov/medlineplus/molds.html
- California Department of Health Services (CADOHS)

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http://www.cal-iaq.org/mold/about-mold

- Minnesota Department of Health
  http://www.health.state.mn.us/divs/eh/indoorair/mold/index.html

- New York City Department of Health and Mental Hygiene
  http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml

- H.R.: The United States Toxic Mold Safety and Protection Act
  http://conyers.house.gov/index.cfm?FuseAction=Issues.Home&Issue_id=061bf20d-19b9-b4b1-12a3-6089055e7c99

EPA

- "Should You Have the Air Ducts in Your Home Cleaned?"

  http://www.epa.gov/iaq/pubs/flood.html

- General information about molds and actions that can be taken to clean up or prevent a mold problem.
  http://www.epa.gov/asthma/molds.html

- "A Brief Guide to Mold, Moisture, and Your Home" - Includes basic information on mold, cleanup guidelines, and moisture and mold prevention.
  http://www.epa.gov/iaq/molds/moldguide.html

- "Mold Remediation in Schools and Commercial Buildings" - Information on remediation in schools and commercial property, references for potential mold and moisture remediators.
  http://www.epa.gov/mold/mold_remediation.html

FEMA

- "Homes That Were Flooded May Harbor Mold Problems" - Information and tips for cleaning mold.
  http://www.fema.gov/diz01/d1364n18.shtm

- "Dealing With Mold & Mildew in Your Flood Damaged Home.
  http://www.fema.gov/pdf/rebuild/recover/fema_mold_brochure_english.pdf

- "Prompt Flood Cleanup Can Help Prevent Health Problems" - How to clean up in-house

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

mold problems (not large or serious exposures).
http://www.fema.gov/news/newsrelease.fema?id=9538

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of tort, contract or any other legal or equitable theory, in excess of the amount paid to EMSL by client thereunder.

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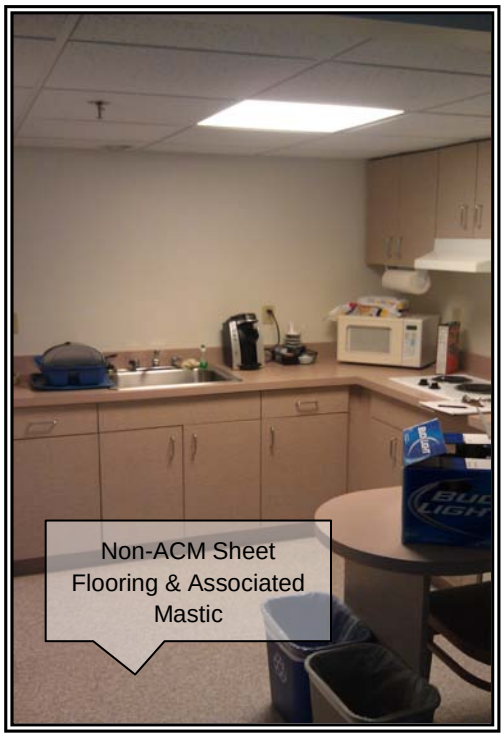
Appendix E

Site Photographs
(As of September 15, 2011)

Appendix C
Site Photographs
(As of September, 15, 2011)

Building #678

Second Floor;
Hallway Utility Closet



Unit 28; Kitchen

Second Floor;
Laundry Room

Hazardous Building Materials Survey Report For Building #678

Naval Station Newport
Newport, Rhode Island

Prepared by:

H&S Environmental, Inc.
160 East Main Street, Suite 2F
Westborough, Massachusetts 01581

September 2011

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE OF WORK....1
2.0 SITE DESCRIPTION....1
3.0 INSPECTION PERSONNEL, METHODS AND LABORATORIES....1
3.1 Inspection Personnel and Process....1
3.1.1 Inspection Personnel....1
3.1.2 Inspection Process....1
3.2 Asbestos Investigation....1
3.2.1 Methodology....2
3.2.2 Definition of Key Inspection Terms....2
3.3 Asbestos Laboratory Services....3
3.3.1 PLM Bulk Sample Analysis....3
3.3.2 Analytical Quality Control Program....3
3.4 LCP Investigation....4
3.4.1 Introduction....4
3.4.2 Testing Methodology....4
3.4.3 XRF Testing Procedures....4
3.4.4 Bulk Paint Chip Sample Analysis....5
3.5 Polychlorinated Biphenyls (PCBs) and DEHP Investigation....5
3.6 Mercury Light Tubes and Thermostats Investigation....5
3.7 Chlorofluorocarbons (CFCs) Investigation....6
3.8 Air Sampling for Mold Concentrations....6
4.0 FINDINGS AND RECOMMENDATIONS....6
4.1 Asbestos-Containing Materials....6
4.1.1 Materials Classified as Asbestos Containing....6
4.1.2 Non-Asbestos-Containing Materials....7
4.2 Lead–Containing Paint....8
4.3 Polychlorinated Biphenyls (PCBs) and DEHP....8
4.4 Mercury....9
4.5 Chlorofluorocarbons....9
4.6 Air Sampling for Mold Concentrations....10

APPENDICES

Appendix A Asbestos Bulk Sample Laboratory Analysis Results
Appendix B Lead Containing Paint Bulk Sample Laboratory Analysis Results & XRF Form
Appendix C Hazardous Building Materials Inventories
Appendix D Mold Air Sampling Laboratory Report with Extended Fungal Summary
Appendix E Site Photographs (As of January 25, 2010)

CERTIFICATION OF RESULTS

This report has been prepared for the exclusive use of the Client, Gale Associates, Inc. and the United States Navy. Photocopying of this document by parties other than those designated by the Client or its affiliates or use of this document for purposes other than it is intended, is prohibited.

Respectfully submitted this 28th day of September 2011.

Report Prepared by:

Matthew Buccella
Building Inspector

Report Reviewed by:

Sean Hurley
Project Manager

1.0 PURPOSE AND SCOPE OF WORK

H&S Environmental, Inc. (H&S) performed a hazardous building materials (HBM's) investigative survey of Building # 678 (the Site) located on the campus of the Naval Station Newport (NSN) located in Newport, Rhode Island. The purpose of the survey was to identify and confirm the presence or absence of asbestos-containing materials (ACMs), lead-containing paints (LCPs), Polychlorinated Biphenyls (PCBs), Mercury, Chlorofluorocarbons (CFCs) and Mold in preparation for possible site redevelopment including renovations and/or demolition of the structure.

The hazardous building materials inspection was conducted on September 15, 2011 in all accessible areas of the site excluding the roof. H&S using an experienced and accredited/licensed inspector and a licensed laboratory as described in Section 3.0 performed the inspection. Specific inspection methods, procedures, definitions and limitations are discussed in Sections 3.2 & 3.3. Section 4.0 contains a discussion of the results of our inspections and H&S's recommendations.

2.0 SITE DESCRIPTION

The site consists of a five-story concrete and brick veneer structure. The building is metal framed. The interior consists of gypsum board walls, 2' x 2' ceiling tile, carpet and resilient flooring materials (i.e. – floor tile & sheet flooring). The facility is currently occupied and functions as living quarters.

3.0 INSPECTION PERSONNEL, METHODS AND LABORATORIES

3.1 Inspection Personnel and Process

3.1.1 Inspection Personnel

The investigative survey was conducted on September 15, 2011 by trained and certified Rhode Island licensed Asbestos Inspector, Mr. Matthew Buccella (License # AAC-0817IS) an experienced asbestos containing materials inspector.

3.1.2 Inspection Process

The inspection for hazardous building materials was conducted in a systematic manner using H&S's standard safety procedures and inspection protocol including:

1. Interviews with individuals knowledgeable about the building. No existing written documentation / information was available regarding the presence or absence of hazardous building materials.

2. A visual inspection of accessible areas of the affected building areas to locate, quantify, and assess the condition of materials suspected to contain asbestos, LCP, PCBs/DEHPs, CFCs, Mercury and Mold

3. Collection and analysis of materials as described herein to determine composition.

3.2 Asbestos Investigation

3.2.1 Methodology

The inspection for suspect ACMs included:

1. Collection of representative bulk samples of each homogeneous area or application of suspect material in sufficient numbers to comply with the Environmental Protection Agency (EPA) / Asbestos Hazard Emergency Response Act (AHERA) minimum criteria (see Chart A below).

2. To prevent release of any airborne asbestos, samples were collected by first carefully wetting the suspect materials and then removing a small full-thickness sample and placing it in a sealed plastic bag labeled with a unique sample identification number.

3. Chain-of-custody documentation was used to ensure sample integrity.

4. Analysis of the bulk samples at an accredited laboratory using the EPA approved Polarized Light Microscopy (PLM) method.

5. A review of the inspection findings and lab results to ensure proper and consistent identification and characterization of all assumed and confirmed ACMs.

Chart A **Minimum Asbestos Bulk Sampling Criteria**	
Type of Suspect Material	Minimum Sampling Criteria
Surfacing	EPA/AHERA mandated statistically random criteria (Min. of 3 Samples; Max. of 7 Samples)
Miscellaneous	Minimum of 2 samples of each homogeneous application (unless otherwise noted)
Thermal System Insulations	Three random samples of each homogeneous application.

3.2.2 Definition of Key Inspection Terms

Given the specific purposes and objectives of this inspection, the following definitions were used for the terms: suspect materials, homogeneous applications or areas of suspect materials, friable materials, inaccessible building areas, and confirmed ACMs:

1. Suspect Materials: Building materials that may contain asbestos. The following materials are considered non-suspect and were not sampled or assessed if observed:

   - Plastic
   - Glass
   - Wood or Wood Composite Materials
   - Brick, Granite, Marble, or Other Stonework
   - Pink or Yellow Fiberglass Insulation on Pipes or Other Mechanical Components
   - Clay or Ceramic Tiles
   - Rubber or Synthetic Foam
   - Paint (unless textured)
   - Concrete or Mortar (except Gyp-Crete)
   - Carpeting, Curtains, Wallpaper, and Other Paper/Natural Fiber, Fabric, or Synthetics

2. Homogeneous Applications or Areas: Suspect materials which serve the same function or purpose (e.g., floor or ceiling tiles), have similar color and texture and were likely installed at or near the same time. Homogeneity is a determining factor in calculating the number of bulk samples collected for a particular material.

3. Friable Materials: Suspect materials that may be easily reduced to a powder by applying hand pressure, (e.g., sprayed-on fireproofing as opposed to a non-friable material such as vinyl floor tile).

4. Inaccessible Building Areas: Building areas, systems, structural components, or surfaces which could not be observed because it was unsafe or impractical to demolish, disassemble, or remove systems or coverings, or because a human being cannot physically enter or observe the area or component. Inaccessible areas include below grade building foundations, pipe trenches and utility vaults/corridors, electrical equipment/wire, pipe gaskets, in-filled window openings, fire doors and enclosed wall and ceiling cavities.

5. Confirmed ACMs: Suspect materials where at least one (1) of the collected bulk samples contained an asbestos concentration of 1% or more. According to EPA's AHERA criteria, all bulk samples of a homogeneous area of suspect ACM must be found to contain less than 1% asbestos to conclude that the material is not regulated as an ACM by EPA under the National Emissions Standard for Hazardous Air Pollutants regulation (NESHAPs).

3.3 Asbestos Laboratory Services

3.3.1 PLM Bulk Sample Analysis

A total of forty-four (44) bulk samples were collected during the inspection and were submitted to EMSL Analytical Services, Inc. (EMSL) located in Woburn, Massachusetts for analysis. EMSL is fully accredited for bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology (NIST). Bulk samples were analyzed for asbestos content using EPA Method 600/R-93/116.

3.3.2 Analytical Quality Control Program

The AmeriSci quality assurance and control program was developed in strict compliance with NIST/NVLAP requirements.

3.4 LCP Investigation

3.4.1 Introduction

Historically, lead was added to paint because its color stability properties made it a desirable pigment and because it enhances durability. Lead-containing paint becomes harmful when inhaled as dust or fumes or when ingested. Once lead pigment was proven to be a health hazard, it was officially banned in 1978 from paint applied in residences.

In an occupational or industrial setting, if lead-containing painted surfaces are to be impacted by renovation or demolition activities, contractor personnel exposure (per OSHA compliance) and waste disposal (per EPA compliance) issues must be addressed and factored into the cost of the project. Specifically, contractors are required to comply with all applicable OSHA regulations including 29 CFR 1926.62 *Lead Exposure on Contractors Interim Final Rule* and 29 CFR 1926.59 *Hazard Communication for the Construction Industry*. These regulations are applicable for all construction workers that are involved in activities that impact lead containing paint and/or generate airborne lead.

3.4.2 Testing Methodology

H&S utilized a Portable X-Ray Fluorescence Analyzer (XRF) to perform the lead-containing paint survey. The XRF is a hand held instrument that contains a radioisotopic source and operates on the principle of X-ray fluorescence. The depression of a spring-loaded button on the XRF unit opens a shutter in the faceplate that allows radiation from an isotopic source to stimulate the lead atoms in the paint. This stimulation causes the atoms to emit (fluoresce) X-rays, which the unit detects and converts into electrical pulses. These pulses are then sorted and counted and the result is read through a digital display on the instrument.

Surface levels of lead are measured in units of milligrams per square centimeter (mg/cm^2). The XRF used in this survey, the Niton Model XL Analyzer, is able to detect as little as 0.01 mg of $lead/cm^2$. OSHA classifies any substance with a detectable amount of lead to be a "lead-containing" material. The Niton XL Lead Paint Analyzer quickly, accurately, and non-destructively measures the concentration of paints and surface coatings.

3.4.3 XRF Testing Procedures

Upon arrival at the job site, a "validation test" is performed to ensure that the XRF instrument is operating properly. The validation test is performed on a calibration test sheet supplied by the manufacturer to determine if the instrument is measuring the lead content consistently. During this survey the instrument was functioning within the standard deviation as defined by the manufacturer.

In conducting the LCP survey, representative tests were performed on homogeneous (similar color, texture, and use) painted surfaces throughout the building. Results were related to other surfaces

possessing similar homogeneous characteristics. By following this sampling protocol, every painted surface did not have to be sampled.

3.4.4 Bulk Paint Chip Sample Analysis

In addition to the XRF testing, one (1) bulk paint chip sample was collected and analyzed to confirm the XRF results. The sample was submitted to EMSL Analytical Services, Inc. (EMSL) located in Woburn, Massachusetts. EMSL is fully accredited for lead bulk sample analysis under the Environmental Lead Proficiency Analytical Testing (ELPAT) Program administered by the American Industrial Hygiene Association (AIHA). The bulk paint chip sample was analyzed for lead content using Atomic Absorption Spectrophotometry (AAS) under EPA Method SW846-7420. Results are included in Appendix C - XRF Tables and Laboratory Results for Lead Containing Paint Testing.

3.5 Polychlorinated Biphenyls (PCBs) and DEHP Investigation

H&S performed an inspection of the Site to identify suspect PCB-containing fluorescent light ballasts and transformers. Additionally fluorescent light fixtures were identified and inventoried for the possible presence of di (2-ethylhexyl) phthalate (DEHP). The survey was conducted in a systematic manner that included:

1. Performing a detailed walk-through to visually inspect and categorize the various types of accessible fluorescent light fixtures.

2. Selecting a representative number of light fixtures to inspect.

3. Listing pertinent information from light ballast labels or nameplates affixed during the manufacturing process.

4. Preparing an inventory of electrical light ballasts and transformers known or suspected to contain PCBs or DEHP.

3.6 Mercury Light Tubes and Thermostats Investigation

An inspection was conducted throughout the Site to identify suspect Mercury-containing equipment and materials as follows:

1. Performing a walk-through and preparation of an inventory of fluorescent light bulbs that may contain Mercury vapor.

2. Performing a walk-through to identify and inventory thermostats and other equipment that contain liquid Mercury.

3.7 Chlorofluorocarbons (CFCs) Investigation

An inspection was conducted throughout the Site to identify suspect chlorofluorocarbons (CFCs) associated with refrigeration and air conditioning equipment. The survey included performing a walk through of the building and preparation of an equipment inventory including an estimate of the size of the unit and/or the estimated quantity of CFCs.

3.8 Air Sampling for Mold Concentrations

To sample for non-viable airborne fungi, H&S used air-sampling cassettes with sampling pumps to draw air onto the filter media. The filter media is sent to an accredited laboratory for microscopic analysis. The airborne aerosols that are trapped on the filter media include mold spores, pollen, insect parts, skin cell fragments, fibers and inorganic particulate.

The sampling cassette is designed to operate at 15 liters per minute (LPM). The sampling period is dependent upon the density of the particulate in the environment. In normal office building conditions the LPM for the pumps are set at higher levels. In most buildings foot traffic and activities are at low to moderate levels. In busier buildings, such as airport terminals, the LPM is at lower levels (5 LPM). In heavy construction areas, the LPM is set at the lowest level (1 LPM). For this investigation, H&S used 15 LPM for eight (8) minute sample durations. The air sampling pump was calibrated with a BIOS DryCal® DC-Lite primary flow meter.

The samples were delivered to EMSL Analytical Services Inc. (EMSL) located in Woburn, Massachusetts. Chain-of-custody documentation was used to ensure sample integrity. EMSL is accredited under the American Industrial Hygiene Association (AIHA). Once processed by the laboratory receiving area, the samples were analyzed by optical microscopy (non-viable). Results are reported as Total Fungi Counts (counts per cubic meter). In addition, identification of mold genus was performed which identified the primary mold colonizers. Please see Appendix D - Mold Air Sampling Laboratory Report with Extended Fungal Summary.

4.0 FINDINGS AND RECOMMENDATIONS

4.1 Asbestos-Containing Materials

4.1.1 Materials Classified as Asbestos Containing

A total of two (2) bulk samples collected from materials from the specified areas confirmed the presence of ACM's. The materials **confirmed** to contain asbestos in the inspected areas are summarized as follows:

Location	Material
Exterior; East Side of Building; Under Brick Façade	Damp-Proofing Material

4.1.2 Non-Asbestos-Containing Materials

The following materials have been classified as **non-ACMs** in the inspected areas:

Location	Material
Exterior; South & East Side of Building	Exterior Finish Insulation System (EFIS)
Exterior; South & East Side of Building	EFIS Adhesive
Exterior; South & East Side of Building	Caulking (EFIS to Concrete)
Exterior; East Side of Building	Original Caulking (Brick to EFIS)
Exterior; South & East Side of Building; First Floor	Original Window Caulking
Exterior; South & East Side of Building; Second Floor	Caulking (Brick to Concrete)
Interior; Units 27 & 40; Kitchen	Speckled Sheet Flooring & Associated Adhesive
Interior; Units 28 & 59; Living Room	Fire Stop Putty (Red)
Interior; Units 28 & 40; Kitchen	2’ x 2’ Ceiling Tile
Interior; Second Floor & Fifth Floor; Hallway; Utility Closet	Air Duct Seam Sealant
Interior; Unit 29; Living Room, Second Floor; Storage Room, Unit 40; Living Room	Joint Compound
Interior; Units 29 & 40; Bathroom	2’ x 2’ Ceiling Tile (Plaster)
Interior; Second Floor; Storage Unit, Third Floor; Laundry Room	12” x 12” Floor Tile (& Associated Mastic)
Interior; Second Floor; Storage Unit, Third Floor; Laundry Room	Covebase Adhesive
Interior; Third Floor; Employee Break Room, Unit 59; Living Room	Carpet Mastic
Interior; First Floor; Mechanical Room	End Cap Paint (On Fiberglass Insulation)

4.1.3 Discussion and Recommendations

The mere presence of asbestos in a building does not mean that the health of building occupants is necessarily at risk. As long as the ACMs remain in good condition and are not disturbed, exposure is unlikely. However, when building maintenance, repair, renovation, demolition or other activities disturb ACMs, or if ACMs are damaged, asbestos fibers are released creating a potential hazard to building occupants. Contractors and employees performing demolition, construction or renovation activities must be informed of the presence of ACMs if the activities may impact these materials.

H&S recommends that all ACMs be removed by a Rhode Island-licensed Asbestos Contractor prior to demolition or renovation of the building.

Until all ACMs are removed, they should be managed according to governing regulations. All ACMs in each of the buildings should be included in a site-specific asbestos operations and maintenance (O&M) program designed at a minimum to comply with 29 CFR 1910.1001 and 1926.1101, incorporating the basic components outlined in the EPA's *Guide to Managing Asbestos in Buildings*. No other actions are recommended at this time.

4.2 Lead–Containing Paint

Testing was performed on primary coated surfaces located throughout the building. A total of one (1) bulk chip was analyzed for lead content. Results of the components indicated that the coatings contain very low concentrations of lead. Detailed results are presented in Appendix B - Lead Containing Paint Bulk Sample Laboratory Analysis Results & XRF Form.

Although the HUD[(1)] lead paint standard classifies lead-based paint (LBP) as that having $\geq$0.5% of lead by weight as analyzed by Atomic Absorption. For the purposes of renovation and/or demolition work, OSHA defines lead-containing paint (LCP) as any paint containing detectable amounts of lead.

The current interpretation of the EPA's Resource Conservation and Recovery Act (RCRA) requires that waste generated during projects where LCPs are present and will be disposed of is tested for the toxicity characteristic of lead in the waste stream. Toxicity Characteristic Leachate Procedure (TCLP) testing is performed to determine whether the waste (construction debris) must be classified as hazardous because of its lead content or if it can be disposed in a conventional construction and demolition (C&D) landfill. The regulatory limit for lead toxicity is 5.0 milligrams per liter (mg/L) using the EPA reference Method SW846-7420 for Atomic Absorption Spectroscopy (AAS).

4.3 Polychlorinated Biphenyls (PCBs) and DEHP

Representative fluorescent light fixtures were inspected throughout the site to determine if the ballasts contained polychlorinated biphenyls, PCBs. Additionally fluorescent light fixtures were identified and inventoried for the possible presence of di (2-ethylhexyl) phthalate (DEHP). Ballasts that do not have labels indicating the absence of PCBs should be assumed to contain PCBs. Ballasts

[(1)] U.S. Department of Housing and Urban Development

that do not contain PCBs should be assumed to contain DEHP. All of the ballasts were observed to be undamaged and not leaking fluids.

All of the representative light fixtures that were inspected were found to have "No PCBs" labeling. As such, the ballasts should be handled as non PCB-containing. However, since the investigation involved inspecting only a representative number of ballasts, all ballasts should be checked for labeling before they are disposed of. Those, which are not labeled "No PCBs", must be removed, packaged and disposed of in accordance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal.

There are two methods currently available for disposal of PCB ballasts including incineration (recycling) and disposal. Incineration is typically more expensive but is believed to reduce the "cradle to grave liability" for the Generator. Regardless of the method, documentation of proper disposal should be provided to the Owner/Generator.

4.4 Mercury

An inventory of fluorescent light bulbs/tubes was prepared in conjunction with the investigation for PCBs (Appendix C). The fluorescent light bulbs located throughout the building are assumed to contain Mercury. All fluorescent light bulbs/tubes known or presumed to contain Mercury must be removed, packaged, handled, transported and disposed of in compliance with governing regulations.

Handling and disposal of all fluorescent light bulbs/lamps presumed to contain Mercury vapor should be performed in compliance with the EPA's Green Lights Program (July 1994) for Lighting Waste Disposal as well as the EPA's Resource Conservation and Recovery Act (RCRA), and other governing regulations. Specific regulations pertaining to the handling, packaging, transportation and disposal (recycling) of Mercury liquid and vapor include the EPA Regulation 40 CFR, Parts 260 through 272.

Additionally, thermostats and associated mechanical equipment were inspected for the possible presence of liquid Mercury. H&S did not observe any elemental mercury vessels in the thermostats.

4.5 Chlorofluorocarbons

H&S observed several types or pieces of equipment that contained confirmed or assumed chlorofluorocarbons, (CFCs). Please see Appendix C for specific locations and quantity.

Chlorofluorocarbon removal, transportation and disposal should be performed by a qualified and experienced CFC reclamation contractor / firm in accordance with governing regulations (e.g. EPA's Clean Air Act Amendments) prior to removal and disposal of this equipment. Newer CFCs, which are unregulated as hazardous air pollutants, do not have similar removal, transport and disposal requirements.

4.6 Air Sampling for Mold Concentrations

Although there are no definitive levels set by Federal or State regulators for airborne fungi, the World Health Organization (WHO), as well as the Industrial Hygiene Community, laboratories and the American Conference of Governmental Industrial Hygienists (ACGHI), has adopted guidelines for assessing airborne fungi. Airborne fungi concentrations below 2,500 C/m^3 are normally not a concern for indoor environments. Airborne levels outdoors are normally between 500 and 1,500 C/m^3, but can easily exceed 20,000 C/m^3 during the spring and summer months.

Indoor airborne levels that exceed 5,000 C/m^3 are typically considered elevated and may be sufficiently elevated to show visible signs of mold contamination. The mold counts collected during this investigation are below the guidelines. Mold counts collected indoors when compared to the mold count collected outdoors, are considered low and should not pose a health risk to the majority of occupants.

APPENDIX A

Asbestos Bulk Sample Laboratory Analysis Results

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Project: **Naval Station Newport; Building 678; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/20/11 11:25 AM
EMSL Order: 131104441

EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-01A *131104441-0001*	Exterior; South Side of Bldg - Exterior Finish Insulation System (EFIS)	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-01B *131104441-0002*	Exterior; East Side of Bldg - Exterior Finish Insulation System (EFIS)	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-02A *131104441-0003*	Exterior; South Side of Bldg - EFIS Adhesive	Blue Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-02B *131104441-0004*	Exterior; East Side of Bldg - EFIS Adhesive	Blue Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-03A *131104441-0005*	Exterior; South Side of Bldg - Caulking @ Column (EFIS to Concrete)	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

Report Amended: 09/26/2011 16:18:44 Replaces the Inital Report 09/24/2011 14:58:25. Reason Code: Client-Additional Analysis

Analyst(s)

Kevin Pine (43)
Steve Grise (1)

Renaldo Drakes, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none dete require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Ir and use of test results are the responsibility of the client.Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available a upong request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-107T3 and VT AL357102

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Received: 09/20/11 11:25 AM
EMSL Order: 131104441

EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**		**% Type**
091311-06-03B *131104441-0006*	Exterior; East Side of Bldg - Caulking @ Column (EFIS to Concrete)	Gray Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-04A *131104441-0007*	Exterior; South Side of Bldg - Caulking @ Spandrel Beam (EFIS to Concrete)	White Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-04B *131104441-0008*	Exterior; South Side of Bldg - Caulking @ Spandrel Beam (EFIS to Concrete)	White Non-Fibrous Homogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-05A *131104441-0009*	Exterior; East Side of Bldg - Original Caulking (Brick to EFIS)	Gray/White Non-Fibrous Heterogeneous		100%	Non-fibrous (other)	**None Detected**
091311-06-05B *131104441-0010*	Exterior; East Side of Bldg - Original Caulking (Brick to EFIS)	Gray/White Non-Fibrous Heterogeneous		100%	Non-fibrous (other)	**None Detected**

Report Amended: 09/26/2011 16:18:44 Replaces the Inital Report 09/24/2011 14:58:25. Reason Code: Client-Additional Analysis

Analyst(s)

Kevin Pine (43)
Steve Grise (1)

Renaldo Drakes, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-107T3 and VT AL357102

EMSL Analytical, Inc.
7 Constitution Way, Suite 107, Woburn, MA 01801
Phone: (781) 933-8411 Fax: (781) 933-8412 Email: bostonlab@emsl.com

Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198
Project: **Naval Station Newport; Building 678; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/20/11 11:25 AM
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EMSL Proj:
Analysis Date: 9/26/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-06A *131104441-0011*	Exterior; South Side of Bldg; 1st Fl - Original Window Caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-06B *131104441-0012*	Exterior; East Side of Bldg; 1st Fl - Original Window Caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-07A *131104441-0013*	Exterior; South Side of Bldg; 2nd Fl - Caulking; Brick to Concrete	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-07B *131104441-0014*	Exterior; East Side of Bldg; 2nd Fl - Caulking; Brick to Concrete	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-08A *131104441-0015*	Unit 27; Kitchen - Linoleum; Speckled	Gray Fibrous Heterogeneous	20%	Cellulose	80%	Non-fibrous (other)	**None Detected**
091311-06-08B *131104441-0016*	Unit 27; Kitchen - Linoleum; Speckled	Gray Fibrous Heterogeneous	20%	Cellulose	80%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos %	Fibrous	Non-Asbestos %	Non-Fibrous	Asbestos % Type
091311-06-09A *131104441-0017*	Unit 27; Kitchen - Mastic a/w 08A	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-09B *131104441-0018*	Unit 27; Kitchen - Mastic a/w 08B	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-10A *131104441-0019*	Unit 28; Living Room - Fire Stop Putty	Red Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-10B *131104441-0020*	Unit 59; Living Room - Fire Stop Putty	Red Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-11A *131104441-0021*	Unit 28; Kitchen - 2x2 Ceiling Tile	Gray Fibrous Homogeneous	40% 40%	Cellulose Min. Wool	20%	Non-fibrous (other)	**None Detected**
091311-06-11B *131104441-0022*	Unit 40; Kitchen - 2x2 Ceiling Tile	Gray Fibrous Homogeneous	40% 40%	Cellulose Min. Wool	20%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-12A *131104441-0023*	2nd Fl ; Hallway; Utility Closet - HVAC Seam Sealant	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-12B *131104441-0024*	5th Fl ; Hallway; Utility Closet - HVAC Seam Sealant	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13A *131104441-0025*	Unit 29; Living Room (Soffit @ Window) - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13B *131104441-0026*	2nd Fl; Storage Room - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-13C *131104441-0027*	Unit 40; Living Room @ Window - Joint Compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-14A *131104441-0028*	Unit 29; Bathroom - 2x2 Ceiling Tile (Plaster)	Tan/White Fibrous Heterogeneous	10% 2%	Cellulose Glass	88%	Non-fibrous (other)	**None Detected**

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			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
091311-06-14B *131104441-0029*	Unit 40; Bathroom - 2x2 Ceiling Tile (Plaster)	Tan/White Fibrous Heterogeneous	10% 2%	Cellulose Glass	88%	Non-fibrous (other)	**None Detected**
091311-06-15A *131104441-0030*	2nd Fl; Storage Unit - 12x12 Floor Tile; Rose Color	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-15B *131104441-0031*	3rd Fl; Laundry Room - 12x12 Floor Tile; Rose Color	Tan Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-16A *131104441-0032*	2nd Fl; Storage Unit - Mastic a/w 15A	Black Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-16B *131104441-0033*	3rd Fl; Laundry Room - Mastic a/w 15B	Black Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
091311-06-17A *131104441-0034*	2nd Fl; Storage Unit - Covebase Adhesive	Yellow Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

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Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
091311-06-17B *131104441-0035*	3rd Fl; Laundry Room - Covebase Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
091311-06-18A *131104441-0036*	3rd Fl; Employee Break Room - Carpet Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
091311-06-18B *131104441-0037*	Unit 59; Living Room - Carpet Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
091311-06-19A *131104441-0038*	1st Fl; Mechanical Room - End Cap Paint on Fiberglass Insulation	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
091311-06-19B *131104441-0039*	1st Fl; Mechanical Room - End Cap Paint on Fiberglass Insulation	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**

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			Non-Asbestos				Asbestos	
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**%**	**Type**
091311-06-20A *131104441-0040*	Exterior; East Side of Bldg - Damproofing under Brick Façade	Black Non-Fibrous Homogeneous			90%	Non-fibrous (other)	**10%**	**Chrysotile**
091311-06-20B *131104441-0041*	Exterior; East Side of Bldg - Damproofing under Brick Façade	Black Non-Fibrous Homogeneous			90%	Non-fibrous (other)	**10%**	**Chrysotile**
091311-06-21A *131104441-0042*	2nd Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	
091311-06-21B *131104441-0043*	3rd Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	
091311-06-21C *131104441-0044*	4th Fl; Stairway Landing - Pipe Insulation Cover	White Fibrous Heterogeneous	30%	Cellulose	70%	Non-fibrous (other)	**None Detected**	

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THIS IS THE LAST PAGE OF THE REPORT.

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City/State/Zip: Wakefield, Massachusetts 01880

Phone: 781.213.9198 **Fax:** 781.213.6992 **Email:** mbuccella@axiomenv.com

Project Name Naval Station Newport; Building 678 **Project #:**

Project Location: Newport, **Project State (US):** RI

TURNAROUND TIME

☐ Rush	☐ 6 Hours	☐ 12 Hours	☐ 24 Hours	☐ 48 Hours	■ 72 Hours	☐ 4 Days	☐ 5 Days	☐ 6-10 Days

SAMPLE MATRIX

☐ Air	■ Bulk	☐ Soil	☐ Wipe	☐ Micro-Vac	☐ Drinking Water	☐ Wastewater	☐ Chips	☐ Other

ASBESTOS ANALYSIS

PCM - Air
- ☐ NIOSH 7400 (A) Issue 2: August 1994
- ☐ OSHA w/TWA

TEM AIR
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402 Issue 2
- ☐ EPA Level II

PLM - Bulk
- ■ EPA 600/R-93/116
- ☐ NY Stratified Point Count
- ☐ California Air Resource Board (CARB) 435
- ☐ NIOSH 9002
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ EPA Point Count (400 Points)
- ☐ EPA Point Count (1,000 Points)
- ☐ Standard Addition Point Count

SOILS
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram
- ☐ Superfund EPA 540-R097-028 (dust generation)

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP-1988-02
- ☐ TEM NOB (Gravimetric) NY 198.4

TEM MICROVAC
- ☐ ASTM D 5755-95 (Quantitative)

TEM WIPE
- ☐ ASTM D-6480-99
- ☐ Qualitative☐

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2
- ☐ Other:_____

LEAD ANALYSIS

Flame Atomic Absorption
- ☐ Wipe, SW846-7420☐ASTM ☐ non ASTM
- ☐ Soil, SW846-7420
- ☐ Air, NIOSH 7082
- ☐ Chips, SW846-7420 or AOAC 5.009 (974.02)
- ☐ Wastewater, SW 846-7420
- ☐ TCLP LEAD SW846-1311/7420

Graphite Furnace Atomic Absorption
- ☐ Air, NIOSH 7105
- ☐ Wastewater, SW846-7421
- ☐ Soil, SW846-7421
- ☐ Drinking Water, EPA 239.2

ICP – Inductively Coupled Plasma
- ☐Wipe, SW846-6010☐ASTM ☐ non ASTM
- ☐ Soil, SW846-6010
- ☐ Air, NIOSH 7300

MATERIALS ANALYSIS

- ☐ Full Particle Identification
- ☐ Optical Particle Identification
- ☐ Dust Mites and Insect Fragments
- ☐ Particle Size & Distribution
- ☐ Product Comparison
- ☐ Paint Characterizaton
- ☐ Failure Analysis
- ☐ Corrosion Analysis
- ☐ Glove Box Containment Study
- ☐ Petrographic Examination of Concrete
- ☐ Portland Cement in Workplace Atmospheres (OSHA ID-143)
- ☐ Man Made Vitrous Fibers – MMVF's
- ☐ Synthetic Fiber Identification
- ☐ Other:_____

MICROBIAL ANALYSIS

Air Samples
- ☐Mold & Fungi by Air O Cell
- ☐Mold & Fungi by Agar Plate count & id
- ☐Bacterial Count and Gram Stain
- ☐Bacterial Count and Identification

Water Samples
- ☐ Total Coliforms, Fecal Coliforms
- ☐ Escherichia Coli, Fecal Streptococcus
- ☐ Legionella
- ☐ Salmonella
- ☐ Giardia and Cryptosporidium

Wipe and Bulk Samples
- ☐ Mold & Fungi – Direct Examination
- ☐ Mold & Fungi – (Culture follow up to direct examination if necessary)
- ☐ Mold & Fungi – Culture (Count & ID)
- ☐ Mold & Fungi – Culture (Count only)
- ☐ Bacterial Count & Gram Stain
- ☐ Bacterial Count & Identification (3 most prominent types)
- ☐ Other:_____

IAQ ANALYSIS

- ☐ Nuisance Dust (NIOSH 0500 & 0600)
- ☐ Airborne Dust (PM10, TSP)
- ☐ Silica Analysis by XRD ☐Niosh 7500
- ☐ HVAC Efficiency
- ☐ Carbon Black
- ☐ Airborne Oil Mist
- ☐ Other:_____

Additional Information/Comments/Instructions:_____

Client Sample # (S) _____ **TOTAL SAMPLE #** 44

Relinquished:	Matthew Buccella	**Date:**	9-19-11	**Time:**	
Received:	RECEIVED	**Date:**		**Time:**	
Relinquished:		**Date:**		**Time:**	
Received:	SEP 20 2011	**Date:**		**Time:**	

BY: SA 1125 walkin

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	SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
1	091311-06-01A	Exterior; South Side of Building / Exterior Finish Insulation System (EFIS)	NA[1]	NA[1]
2	091311-06-01B	Exterior; East Side of Building / Exterior Finish Insulation System (EFIS)	NA[1]	NA[1]
3	091311-06-02A	Exterior; South Side of Building /EFIS Adhesive	NA[1]	NA[1]
4	091311-06-02B	Exterior; East Side of Building / EFIS Adhesive	NA[1]	NA[1]
5	091311-06-03A	Exterior; South Side of Building / Caulking @ Column (EFIS to Concrete)	NA[1]	NA[1]
6	091311-06-03B	Exterior; East Side of Building / Caulking @ Column (EFIS to Concrete)	NA[1]	NA[1]
7	091311-06-04A	Exterior; South Side of Building / Caulking @ Spandrel Beam (EFIS to Concrete)	NA[1]	NA[1]
8	091311-06-04B	Exterior; East Side of Building / Caulking @ Spandrel Beam (EFIS to Concrete)	NA[1]	NA[1]
9	091311-06-05A	Exterior; South Side of Building / Original Caulking (Brick to EFIS)	NA[1]	NA[1]
10	091311-06-05B	Exterior; East Side of Building / Original Caulking (Brick to EFIS)	NA[1]	NA[1]
11	091311-06-06A	Exterior; South Side of Building; First Floor / Original Window Caulking	NA[1]	NA[1]
12	091311-06-06B	Exterior; East Side of Building; First Floor / Original Window Caulking	NA[1]	NA[1]
13	091311-06-07A	Exterior; South Side of Building; Second Floor / Caulking; Brick to Concrete	NA[1]	NA[1]
14	091311-06-07B	Exterior; East Side of Building; Second Floor / Caulking; Brick to Concrete	NA[1]	NA[1]
15	091311-06-08A	Unit 27; Kitchen / Linoleum (Speckled)	NA[1]	NA[1]
16	091311-06-08B	Unit 27; Kitchen / Linoleum (Speckled)	NA[1]	NA[1]
17	091311-06-09A	Unit 27; Kitchen / Mastic Associated w/ Sample 08A	NA[1]	NA[1]
18	091311-06-09B	Unit 59; Kitchen / Mastic Associated w/ Sample 08B	NA[1]	NA[1]
19	091311-06-10A	Unit 28; Living Room / Fire Stop Putty	NA[1]	NA[1]
20	091311-06-10B	Unit 59; Living Room / Fire Stop Putty	NA[1]	NA[1]
21	091311-06-11A	Unit 28; Kitchen / 2' x 2' Ceiling Tile	NA[1]	NA[1]
22	091311-06-11B	Unit 40; Kitchen / 2' x 2' Ceiling Tile	NA[1]	NA[1]
23	091311-06-12A	Second Floor; Hallway; Utility Closet / HVAC Seam Sealant	NA[1]	NA[1]
24	091311-06-12B	Fifth Floor; Hallway; Utility Closet / HVAC Seam Sealant	NA[1]	NA[1]
25	091311-06-13A	Unit 29; Living Room (Soffit @ Window) / Joint Compound	NA[1]	NA[1]
26	091311-06-13B	Second Floor; Storage Room / Joint Compound	NA[1]	NA[1]
27	091311-06-13C	Unit 40; Living Room (@ Window) / Joint Compound	NA[1]	NA[1]
28	091311-06-14A	Unit 29; Bathroom / 2' x 2' Ceiling Tile (Plaster)	NA[1]	NA[1]
29	091311-06-14B	Unit 40; Bathroom / 2' x 2' Ceiling Tile (Plaster)	NA[1]	NA[1]

Relinquished:	**Matthew Buccella**	**Date:**	**9-16-11**	**Time:**	
Received:	RECEIVED	**Date:**		**Time:**	
Relinquished:		**Date:**		**Time:**	
Received:	SEP 20 2011	**Date:**		**Time:**	
	BY: SA 1125				

[1] Not Applicable

131104441

131104441

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(781) 933-8411	(203) 284-5948	(866) 448-3675	(800) 220-3675
(781) 933-8412 Fax	(203) 284-5978 Fax	(212) 290-0058 Fax	(856) 858-4960 Fax

	SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
30	091311-06-15A	Second Floor; Storage Unit / 12" x 12" Floor Tile (Rose Color)	NA[1]	NA[1]
31	091311-06-15B	Third Floor; Laundry Room / 12" x 12" Floor Tile (Rose Color)	NA[1]	NA[1]
32	091311-06-16A	Second Floor; Storage Unit / Mastic Associated w/ Sample 15A	NA[1]	NA[1]
33	091311-06-16B	Third Floor; Laundry Room / Mastic Associated w/ Sample 15B	NA[1]	NA[1]
34	091311-06-17A	Second Floor; Storage Unit / Covebase Adhesive	NA[1]	NA[1]
35	091311-06-17B	Third Floor; Laundry Room / Covebase Adhesive	NA[1]	NA[1]
36	091311-06-18A	Third Floor; Employee Break Room / Carpet Mastic	NA[1]	NA[1]
37	091311-06-18B	Unit 59; Living Room / Carpet Mastic	NA[1]	NA[1]
38	091311-06-19A	First Floor; Mechanical Room / End Cap Paint (On Fiberglass Insulation)	NA[1]	NA[1]
39	091311-06-19B	First Floor; Mechanical Room / End Cap Paint (On Fiberglass Insulation)	NA[1]	NA[1]
40	091311-06-20A	Exterior; East Side of Building / Damp Proofing (Under Brick Façade)	NA[1]	NA[1]
41	091311-06-20B	Exterior; East Side of Building / Damp Proofing (Under Brick Façade)	NA[1]	NA[1]
42	091311-06-21A	Second Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]
43	091311-06-21B	Third Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]
44	091311-06-21C	Fourth Floor; Stairway Landing / Pipe Insulation Cover	NA[1]	NA[1]

Relinquished:	**Matthew Buccella**	**Date:**	**9-19-11**	**Time:**	
Received:		**Date:**		**Time:**	
Relinquished:	RECEIVED	**Date:**		**Time:**	
Received:	SEP 20 2011	**Date:**		**Time:**	

BY: SQ 1125

[1] Not Applicable

APPENDIX B

Lead Containing Paint Bulk Sample
Laboratory Analysis Report & XRF Form

EMSL Analytical, Inc.
3 Cooper St., Westmont, NJ 08108
Phone: (856) 858-4800 Fax: (856) 858-9551 Email: westmontleadlab@emsl.com

Attn: **Matt Buccella**
Axiom Partners, Inc.
979 Main Street

Wakefield, MA 01880

Fax: (781) 213-6992 Phone: (781) 213-9198

Project: **Naval Station Newport; Colbert Plaza; Newport, RI**

Customer ID: AXIO80
Customer PO:
Received: 09/21/11 10:14 AM
EMSL Order: 201111412

EMSL Proj:

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
LBP-01	*0001*		9/23/2011	<0.011 % wt
	Site: Unit 20; Closet Wall Paint; Beige			

Initial report from 09/23/2011 13:51:50

Julie Smith - Laboratory Director
NJ-NELAP Accredited:04653
or other approved signatory

Reporting limit is 0.01 % wt. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected . This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc. Westmont, NJ NELAP Certifications: NJ 04653, NY 10896, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

201111412

201111412

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www.emsl.com

Your Name: Matthew Buccella **Project Manager:** Matt Buccella / Sean Hurley

Company: Axiom Partners, Inc.

Street: 979 MAIN STREET

City/State/Zip: Wakefield, Massachusetts 01880

Phone: 781.213.9198 **Fax:** 781.213.6992 **Email:** mbuccella@axiomenv.com

Project Name Naval Station Newport; Colbert Plaza **Project #:**

Project Location: Newport, **Project State (US):** RI

TURNAROUND TIME

☐ Rush	☐ 6 Hours	☐ 12 Hours	☐ 24 Hours	☐ 48 Hours	■ 3 Days	☐ 4 Days	☐ 5 Days	☐ 6-10 Days

SAMPLE MATRIX

☐ Air	■ Bulk	☐ Soil	☐ Wipe	☐ Micro-Vac	☐ Drinking Water	☐ Wastewater	☐ Chips	☐ Other

ASBESTOS ANALYSIS

PCM - Air
- ☐ NIOSH 7400 (A) Issue 2: August 1994
- ☐ OSHA w/TWA

TEM AIR
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402 Issue 2
- ☐ EPA Level II

PLM - Bulk
EPA 600/R-93/116
- ☐ NY Stratified Point Count
- ☐ California Air Resource Board (CARB) 435
- ☐ NIOSH 9002
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ EPA Point Count (400 Points)
- ☐ EPA Point Count (1,000 Points)
- ☐ Standard Addition Point Count

SOILS
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram
- ☐ Superfund EPA 540-R097-028 (dust generation)

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP-1988-02
- ☐ TEM NOB (Gravimetric) NY 198.4

TEM MICROVAC
- ☐ ASTM D 5755-95 (Quantitative)

TEM WIPE
- ☐ ASTM D-6480-99
- ☐ Qualitative☐

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2
- ☐ Other:_____

LEAD ANALYSIS

Flame Atomic Absorption
- ☐ Wipe, SW846-7420☐ASTM ☐ non ASTM
- ☐ Soil, SW846-7420
- ☐ Air, NIOSH 7082
- ■ Chips, SW846-7420 or AOAC 5.009 (974.02)
- ☐ Wastewater, SW 846-7420
- ☐ TCLP LEAD SW846-1311/7420

Graphite Furnace Atomic Absorption
- ☐ Air, NIOSH 7105
- ☐ Wastewater, SW846-7421
- ☐ Soil, SW846-7421
- ☐ Drinking Water, EPA 239.2

ICP – Inductively Coupled Plasma
- ☐Wipe, SW846-6010☐ASTM ☐ non ASTM
- ☐ Soil, SW846-6010
- ☐ Air, NIOSH 7300

MATERIALS ANALYSIS

- ☐ Full Particle Identification
- ☐ Optical Particle Identification
- ☐ Dust Mites and Insect Fragments
- ☐ Particle Size & Distribution
- ☐ Product Comparison
- ☐ Paint Characterizaton
- ☐ Failure Analysis
- ☐ Corrosion Analysis
- ☐ Glove Box Containment Study
- ☐ Petrographic Examination of Concrete
- ☐ Portland Cement in Workplace Atmospheres (OSHA ID-143)
- ☐ Man Made Vitrous Fibers – MMVF's
- ☐ Synthetic Fiber Identification
- ☐ Other:_____

MICROBIAL ANALYSIS

Air Samples
- ☐Mold & Fungi by Air O Cell
- ☐Mold & Fungi by Agar Plate count & id
- ☐Bacterial Count and Gram Stain
- ☐*Bacterial Count and Identification*

Water Samples
- ☐ Total Coliforms, Fecal Coliforms
- ☐ Escherichia Coli, Fecal Streptococcus
- ☐ Legionella
- ☐ Salmonella
- ☐ Giardia and Cryptosporidium

Wipe and Bulk Samples
- ☐ Mold & Fungi – Direct Examination
- ☐ Mold & Fungi – (Culture follow up to direct examination if necessary)
- ☐ Mold & Fungi – Culture (Count & ID)
- ☐ Mold & Fungi – Culture (Count only)
- ☐ Bacterial Count & Gram Stain
- ☐ Bacterial Count & Identification (3 most prominent types)
- ☐ Other:_____

IAQ ANALYSIS

- ☐ Nuisance Dust (NIOSH 0500 & 0600)
- ☐ Airborne Dust (PM10, TSP)
- ☐ Silica Analysis by XRD ☐Niosh 7500
- ☐ HVAC Efficiency
- ☐ Carbon Black
- ☐ Airborne Oil Mist
- ☐ Other:_____

Additional Information/Comments/Instructions:_____

Client Sample # (S) _____ **TOTAL SAMPLE #** _____

Relinquished:	Matthew Buccella	**Date:** 9-20-11	**Time:**
Received:	RECEIVED	**Date:**	**Time:**
Relinquished:	SEP 20 2011	**Date:**	**Time:**
Received:	BY: SA 1125 walkin	**Date:**	**Time:**

Rec'd Walkin 9/21/11 AM

21 SEP 21 AM 10:14

201111412

201111412

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(781) 933-8412 Fax	(203) 284-5978 Fax	(212) 290-0058 Fax	(856) 858-4960 Fax

SAMPLE NUMBER	LOCATION / SAMPLE DESCRIPTION	VOLUME Air (L)	Area (Inches sq.)
LBP-01	Unit 20; Closet Wall Paint; Beige	NA[1]	NA[1]

Relinquished: Matthew Buccella **Date:** 9-20-11 **Time:**

Received: **Date:** **Time:**

RECEIVED

SEP 20 2011

BY: SA 1125

RECEIVED EMSL WESTMONT, N.J. 11 SEP 21 AM 10:14

[1] Not Applicable

APPENDIX C

Hazardous Building Materials Inventories
(Chlorofluorocarbons)
(Mercury Containing Equipment)
(Fluorescent Bulbs & Ballasts)

HBM INVENTORY
Naval Station Newport – Building #678
Newport, Rhode Island
September 2011

Fluorescent Light Bulbs & Ballasts

Description	Qty	Location	Mfg./Model
Compact Fluorescent Bulb Fixture	~60	Throughout Hallways	Advance Cat. No. VS-25110-2-TP
Four Foot Bulb Fixture	~175	Throughout Hallways & Kitchens	Advance Cat. No. VS-25110-2-TP

Mercury-Containing Thermostats and Thermometers

Location	Manufacturer	Number of Units
Not Applicable (NA)	NA	NA

Chlorofluorocarbons

Locations	Equipment	Quantity
Throughout Kitchens	Refrigerator	1 (per unit)
Roof Top	Large Unit	Unkown

APPENDIX D

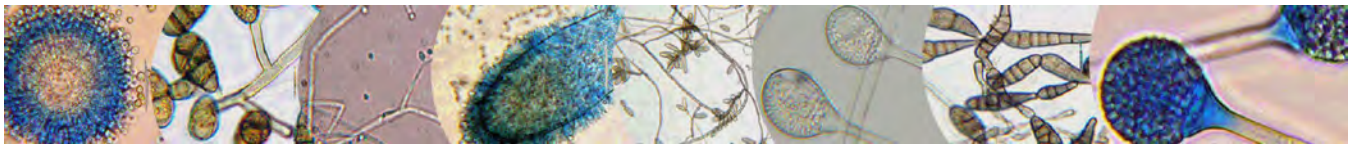
Mold Air Sampling Laboratory Report
With Extended Fungal Summary

EXPANDED FUNGAL REPORT ®

Prepared Exclusively For

Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

Report Date:	**9/28/2011**
Project:	**Naval Station Newport; Building 678; Newport, RI**
EMSL Order:	**131104523**



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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

1. Description of Analysis

Analytical Laboratory
EMSL Analytical, Inc. (EMSL) is a nationwide, full service, analytical testing laboratory network providing Asbestos, Mold, Indoor Air Quality, Microbiological, Environmental, Chemical, Forensic, Materials, Industrial Hygiene and Mechanical Testing services since 1981. Ranked as the premier independently owned environmental testing laboratory in the nation, EMSL puts analytical quality as its top priority. This quality is recognized by many well-respected federal, state and private accrediting agencies, such as AIHA's EMLAP and EMPAT programs, and assured by our high quality personnel, including many Ph.D. microbiologists and mycologists.

EMSL is an independent laboratory that performed the analysis of these samples. EMSL did not conduct the sampling or site investigation for this report. The samples referenced herein were analyzed under strict quality control procedures using state-of-the-art microbiological methods. The analytical methods used and the data presented are scientifically and legally defensible.

The laboratory data is provided in compliance with AIHA policy modules and ISO 17025 guidelines for the particular test(s) requested, including any associated limitations for the methods employed. These data are intended for use by professionals having knowledge of the testing methods necessary to interpret them accurately.

Air Samples - Spore traps:
Spore traps are commercially available sampling devices that capture airborne particles on an adhesive slide. Air is pulled through the device using a vacuum pump. Spores, as well as other airborne particles, are impacted on the collection adhesive. Using spore trap collection methods has inherent limitations. These collection methods are biased towards larger spore sizes.

The analysis for total spore counts is a direct microscopic examination and does not include culturing or growing the fungi. Therefore, the results include both viable and non-viable spores. Some fungal groups produce similar spore types that cannot be distinguished by direct microscopic examination alone (i.e., *Aspergillus/Penicillium*, and others). Other spore types may lack distinguishing features that aid in their identification. These types are grouped into larger categories such as Ascospores or Basidiospores.

Fungal spores are identified and grouped by morphological characteristics including color, shape, septation, ornamentation, and fruiting structures (if present) which are compared to published mycological identification keys and texts. EMSL reports provide spore counts per cubic meter of air to three significant figures. Please note that each spore category is reported to three significant figures. Due to rounding and the application of three significant

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

figures the sum of the individual spore numbers may not equal the total spore count on the report. EMSL does not maintain responsibility for final volume concentrations (counts/m3) since this volume is provided by the field collector and can not be verified by EMSL.

EMSL analyzes spore traps using phase contrast microscopy. There is a wide choice of collection devices (Air-O-Cell, Micro-5, Burkhard, etc.) on the market. Differences in analytical method may exist between spore trap devices.

Spore trap results are reported in spores per cubic meter of air. Due to the other airborne particles collected with the spores, EMSL reports a background particle density. Background density is an indication of overall particulate matter present on the sample (i.e. dust in the air). High background concentrations may obscure spores such as the *Penicillium*/*Aspergillus* group. The rating system is from 1-5 with 1 = 1 - 25% of the background obscured by material, 2 = 26 - 50%, 3 = 51 - 75%, 4 = 76% - 99%, 5 = 100% or overloaded. A background rating of 4 or higher should be regarded as a minimum count since the actual concentrations may be higher than those reported. EMSL will not be held responsible for overloading of samples. Sample volumes are left to the discretion of the company or persons conducting the fieldwork.

Skin fragment density is the percentage of skin cells making up the total background material, 1 = 1 - 25%, 2 = 26 - 50%, 3 = 51 - 75%, 4 = 76-100%. Skin fragment density is considered an indication of the general cleanliness in the area sampled. It has been estimated that up to 90% of household dust consists of dead skin cells.

2. Analytical Results

See attached data reports and charts.

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0001
Client Sample ID: 746551
Location: Bldg 678; Unit 20 @ Window
Sample Volume (L): 120
Sample Type: Inside
Comments:

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	None Detected	27	Less than Background
Ascospores	None Detected	None Detected	Equal To Background
Aspergillus/Penicillium	405	None Detected	405
Basidiospores	405	1220	Less than Background
Bipolaris++	None Detected	None Detected	Equal To Background
Chaetomium	None Detected	None Detected	Equal To Background
Cladosporium	459	1320	Less than Background
Curvularia	None Detected	27	Less than Background
Epicoccum	None Detected	None Detected	Equal To Background
Fusarium	None Detected	None Detected	Equal To Background
Ganoderma	None Detected	81	Less than Background
Myxomycetes++	None Detected	None Detected	Equal To Background
Pithomyces	81	27	54
Rust	None Detected	None Detected	Equal To Background
Scopulariopsis	None Detected	None Detected	Equal To Background
Smut	None Detected	27	Less than Background
Stachybotrys	None Detected	None Detected	Equal To Background
Torula	None Detected	None Detected	Equal To Background
Ulocladium	None Detected	None Detected	Equal To Background
Unidentifiable Spores	None Detected	None Detected	Equal To Background
Zygomycetes	None Detected	None Detected	Equal To Background
Total Fungi	**1350**	**2730**	**Less than Background**
Hyphal Fragment	27	None Detected	27
Insect Fragment	None Detected	None Detected	Equal To Background
Pollen	None Detected	None Detected	Equal To Background

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	2	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless othewise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" denotes not detected. EMSL maintains liability limited to cost of anaysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Renaldo Drakes, Laboratory Manager
or other Approved Signatory

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0002
Client Sample ID: 001331
Location: Bldg 678; 2nd Fl; Laundry Rm
Sample Volume (L): 120
Sample Type: Inside
Comments:

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	27	27	Equal To Background
Ascospores	None Detected	None Detected	Equal To Background
Aspergillus/Penicillium	54	None Detected	54
Basidiospores	81	1220	Less than Background
Bipolaris++	None Detected	None Detected	Equal To Background
Chaetomium	None Detected	None Detected	Equal To Background
Cladosporium	270	1320	Less than Background
Curvularia	27	27	Equal To Background
Epicoccum	None Detected	None Detected	Equal To Background
Fusarium	None Detected	None Detected	Equal To Background
Ganoderma	None Detected	81	Less than Background
Myxomycetes++	None Detected	None Detected	Equal To Background
Pithomyces	27	27	Equal To Background
Rust	None Detected	None Detected	Equal To Background
Scopulariopsis	None Detected	None Detected	Equal To Background
Smut	27	27	Equal To Background
Stachybotrys	None Detected	None Detected	Equal To Background
Torula	None Detected	None Detected	Equal To Background
Ulocladium	None Detected	None Detected	Equal To Background
Unidentifiable Spores	54	None Detected	54
Zygomycetes	None Detected	None Detected	Equal To Background
Total Fungi	**567**	**2730**	**Less than Background**
Hyphal Fragment	None Detected	None Detected	Equal To Background
Insect Fragment	None Detected	None Detected	Equal To Background
Pollen	27	None Detected	27

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	2	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless othewise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" denotes not detected. EMSL maintains liability limited to cost of anaysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Renaldo Drakes, Laboratory Manager
or other Approved Signatory

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Attn: Matt Buccella
Axiom Partners, Inc.
979 Main Street
Wakefield, MA 01880

EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

Proj: Naval Station Newport; Building 678; Newport, RI

Test Report: Allergenco-D(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (EMSL Method 05-TP-003)

Lab Sample Number: 131104523-0003
Client Sample ID: 001347
Location: Exterior; Courtyard
Sample Volume (L): 120
Sample Type: Background
Comments

Particle Identification	Sample Concentration (counts/m³)	Background Concentration (counts/m³)	Background Corrected (counts/m³)
Alternaria	27	27	N/A
Ascospores	None Detected	None Detected	N/A
Aspergillus/Penicillium	None Detected	None Detected	N/A
Basidiospores	1220	1220	N/A
Bipolaris++	None Detected	None Detected	N/A
Chaetomium	None Detected	None Detected	N/A
Cladosporium	1320	1320	N/A
Curvularia	27	27	N/A
Epicoccum	None Detected	None Detected	N/A
Fusarium	None Detected	None Detected	N/A
Ganoderma	81	81	N/A
Myxomycetes++	None Detected	None Detected	N/A
Pithomyces	27	27	N/A
Rust	None Detected	None Detected	N/A
Scopulariopsis	None Detected	None Detected	N/A
Smut	27	27	N/A
Stachybotrys	None Detected	None Detected	N/A
Torula	None Detected	None Detected	N/A
Ulocladium	None Detected	None Detected	N/A
Unidentifiable Spores	None Detected	None Detected	N/A
Zygomycetes	None Detected	None Detected	N/A
Total Fungi	**2730**	**2730**	**N/A**
Hyphal Fragment	None Detected	None Detected	N/A
Insect Fragment	None Detected	None Detected	N/A
Pollen	None Detected	None Detected	N/A

Analytical Sensitivity 600x:	27	counts/cubic meter
Analytical Sensitivity 300x *:	8*	counts/cubic meter
Skin Fragments:	1	1 to 4 (low to high)
Fibrous Particulate:	1	1 to 4 (low to high)
Background:	2	1 to 4 (low to high); 5 (overloaded)

Initial report from: 09/27/2011 11:25:10

Bipolaris++ = Bipolaris/Dreschlera/Exserohilum Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless othewise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" denotes not detected. EMSL maintains liability limited to cost of anaysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

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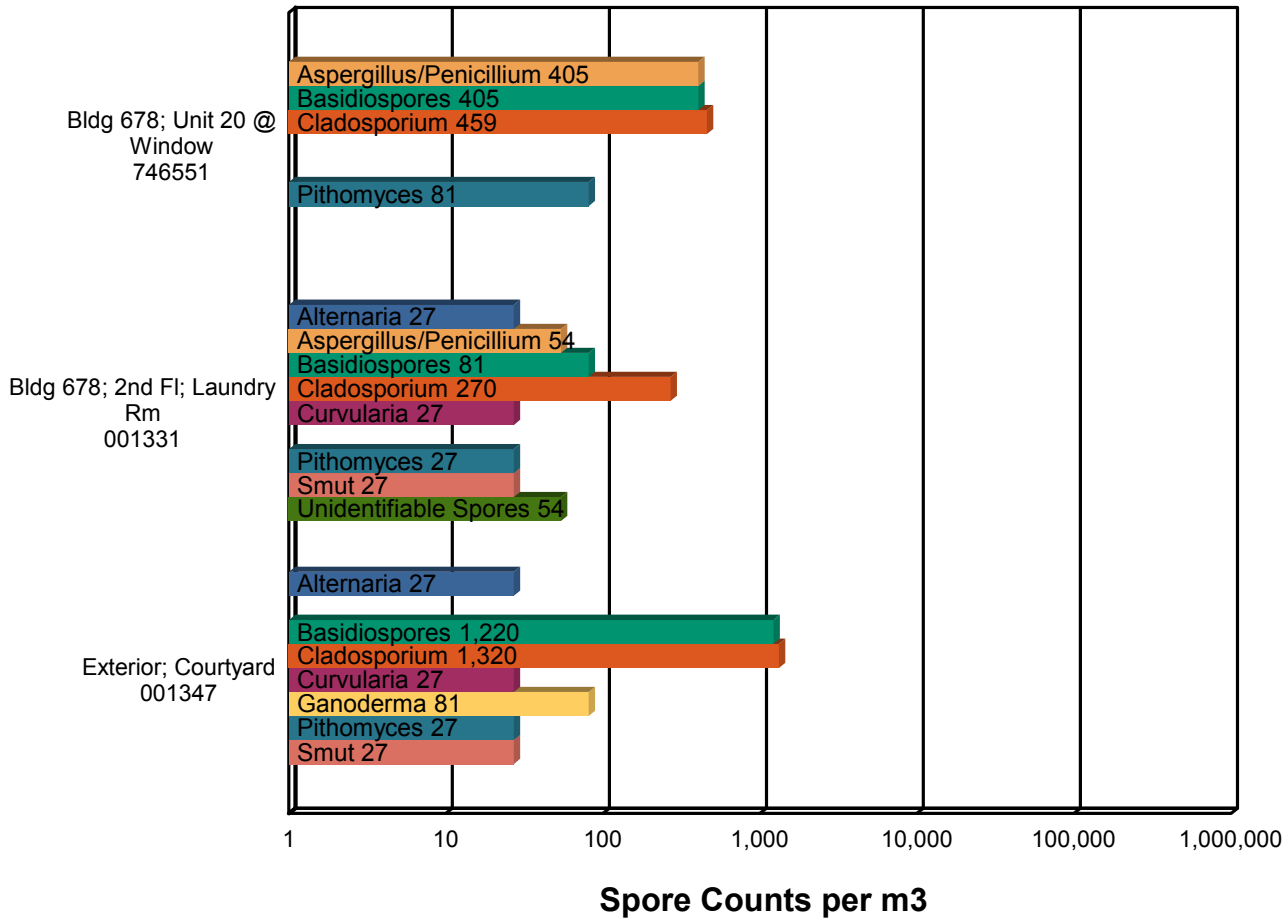
Spore Trap Report: Total Counts



Alternaria · Aspergillus/Penicillium · Basidiospores · Cladosporium · Curvularia · Ganoderma · Pithomyces · Smut · Unidentifiable Spores

* The chart is displayed using a logarithmic scale. Bar size is not directly proportional to the number of spores.

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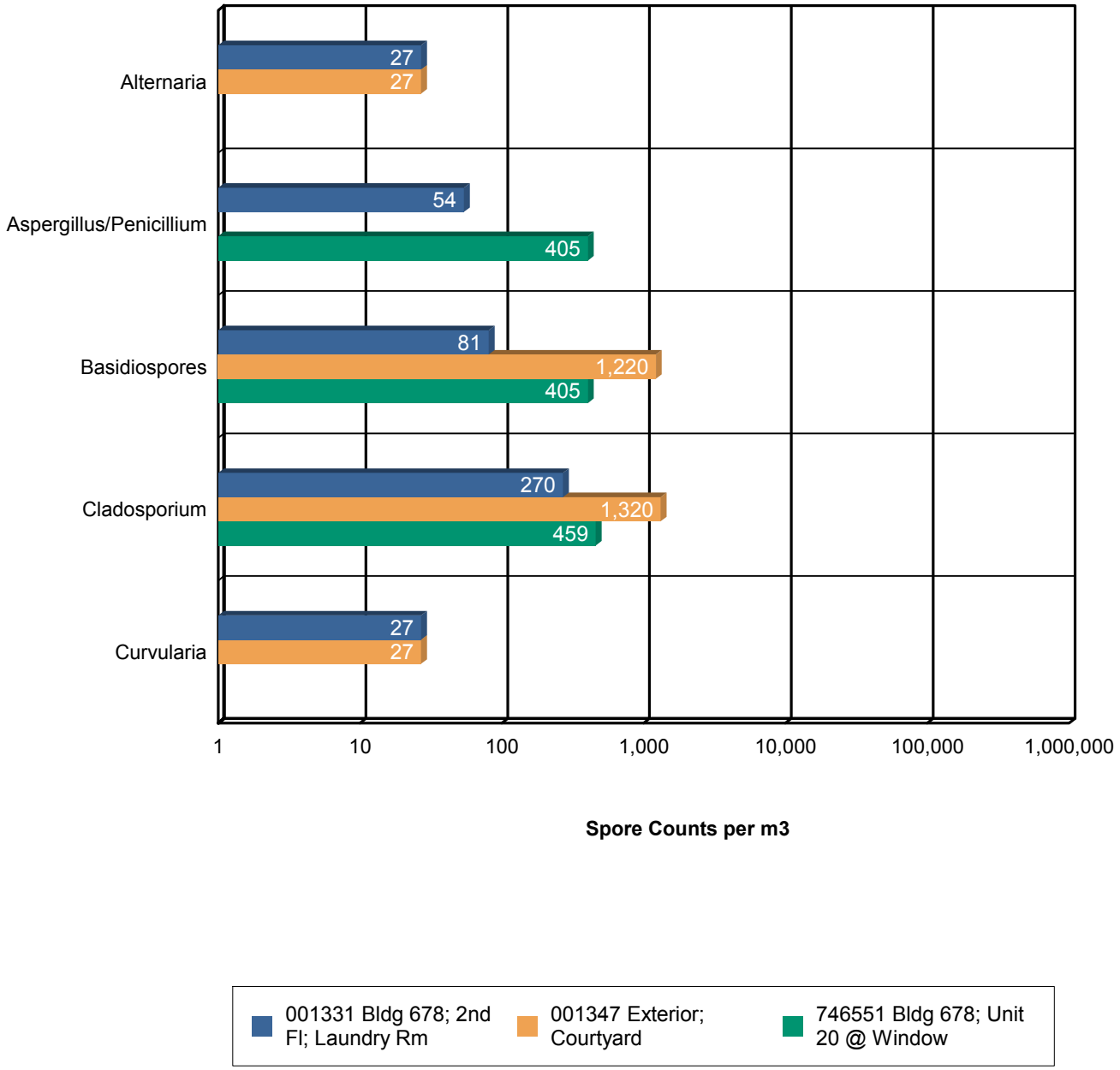
Background Comparison Chart



* The chart is displayed using a logarithmic scale. The bar size is not directly proportional to the number of spores.

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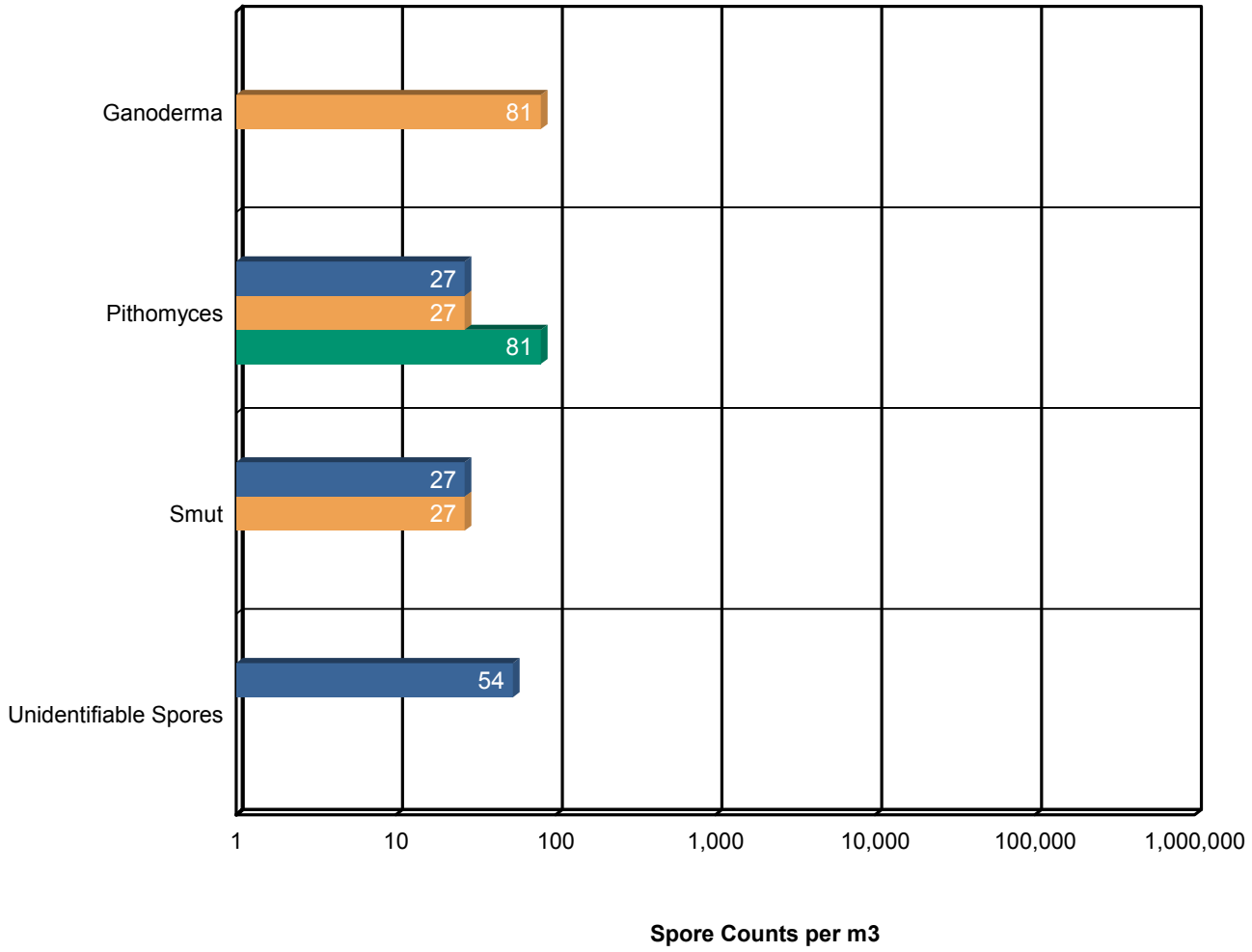
Background Comparison Chart



* The chart is displayed using a logarithmic scale. The bar size is not directly proportional to the number of spores.

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3. Understanding the Results

EMSL Analytical, Inc. is an independent laboratory, providing unbiased and scientifically valid results. These data represent only a portion of an overall IAQ investigation. Visual information and environmental conditions measured during the site assessment (humidity, moisture readings, etc.) are crucial to any final interpretation of the results. Many factors impact the final results; therefore, result interpretation should only be conducted by qualified individuals. The American Conference of Governmental Industrial Hygienists (ACGIH) has published a good reference book covering sampling and data interpretation. It is entitled, Bioaerosols: Assessment and Control, 1999.

Air Samples:
Air samples are typically evaluated by means of fungal type identified and by comparing indoor and outdoor concentrations, complaint to non-complaint areas, or area of concern to areas of non-concern. In general, the levels and types of fungi in the indoor air (in non-problem buildings) should be similar to or lower than those found in the outdoor air. Higher levels of spores (order of magnitude) found inside may indicate that moisture sources and resultant fungal growth are present. Spore count results are influenced by geographic location, seasonal and diurnal variation, and biotic/abiotic outside conditions. For example, fresh snow cover on the ground will affect the outdoor spore count concentration.

Use the following guidelines when interpreting the results:

1. The composition and diversity of fungi in indoor, non-problem buildings should be similar to that of the outdoor air.
2. Compare spore count concentrations indoors and outdoors. Elevated indoor concentrations may indicate indoor fungal growth. Be aware that this is not always consistent and additional sampling may be needed.
3. Certain fungi are very good indicators of water damage. The presence of these spores, even in small quantities, indicates the presence of water damage. These indicator fungi include, but are not limited to, *Chaetomium, Fusarium, Stachybotrys* (including *Memnoniella*), and *Ulocladium*.
4. Different types of fungi grow at different levels of biologically available water. These differences in fungal growth suggest the degree of water damage or saturation. For example, *Stachybotrys* is an indication of short term, severe, or prolonged water damage over time.

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Fungal spores are found everywhere. Whether or not symptoms develop in people exposed to fungi depends on the nature of the fungal material (e.g., allergenic, toxic, or infectious), the exposure level, and the susceptibility of exposed persons. Susceptibility varies with the genetic predisposition (e.g., allergic reactions do not always occur in all individuals), age, pre-existing medical conditions (e.g., diabetes, cancer, or chronic lung conditions), use of immunosuppressive drugs, and concurrent exposures. These reasons make it difficult to identify dose/response relationships that are required to establish “safe” or “unsafe” levels (i.e., permissible exposure limits).

It is generally accepted in the industry that indoor fungal growth is undesirable and inappropriate, necessitating removal or other appropriate remedial actions. The New York City guidelines and EPA guidelines for mold remediation in schools and commercial buildings define the conditions warranting mold remediation. Always remember that water is the key. Preventing water damage or water condensation will prevent mold growth.

This report is not intended to provide medical advice or advice concerning the relative safety of an occupied space. Always consult an occupational or environmental health physician who has experience addressing indoor air contaminants if you have any questions.

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4. Glossary of Fungi

ALTERNARIA	
Natural Habitat	Common saprobe and pathogen of plants. Typically found on plant tissue, decaying wood, and foods. Soil . Air outdoors.
Suitable Substrates in the Indoor Environment	Indoors near condensation (window frames, showers). House dust (in carpets, and air) Also colonizes building supplies, computer disks, cosmetics, leather, optical instruments, paper, sewage, stone monuments, textiles, wood pulp, and jet fuel
Water Activity	Aw =0.85-0.88
Mode of Dissemination	Wind
Allergic Potential	Type I allergies (hay fever, asthma), Type III (hypersensitivity pneumonitis)
Potential or Opportunistic Pathogens	Phaeohyphomycosis {causing cystic granulomas in the skin and subcutaneous tissue}. In immunocompetent patients, Alternaria colonizes the paranasal sinuses, leading to chronic hypertrophic sinusitis
Industrial Uses	Biocontrol of weed plants ·Biocontrol fungal plant pathogens.
Potential Toxins Produced	Alternariol (AOH) . Alternariol monomethylether (AME). Tenuazonic acid (TeA). Altenuene (ALT). Altertoxins (ATX)
Other Comments	Alternaria spores are one of the most common and potent indoor and outdoor airborne allergens. Additionally, Alternaria sensitization has been determined to be one of the most important factors in the onset of childhood asthma. Synergy with Cladosporium or Ulocladium may increase the severity of symptoms

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ASPERGILLUS/PENICILLIUM

Natural Habitat	·Plant debris ·Seed ·Cereal crops
Suitable Substrates in the Indoor Environment	Grows on a wide range of substrates indoors ·Prevalent in water damaged buildings ·Foods (blue mold on cereals, fruits, vegetables, dried foods) ·House dust ·Fabrics ·Leather ·Wallpaper ·Wallpaper glue
Water Activity	Aw=0.75-0.94
Mode of Dissemination	Wind ·Insects
Allergic Potential	Type I (hay fever, asthma) ·Type III (hypersensitivity)
Potential or Opportunistic Pathogens	Possible depending on the species.
Industrial Uses	Many depending on the species
Potential Toxins Produced	Possible depending on the species.
Other Comments	Spores of Aspergillus and Penicillium (including others such as Acremonium and Paecilomyces) are small and spherical with few distinguishing characteristics. They cannot be differentiated or speciated by non-viable impaction sampling methods. Some species with very small spores may be undercounted in samples with high background debris.

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BASIDIOSPORES

Natural Habitat	Forest floors. Lawns .Plants (saprobes or pathogens depending on genus)
Suitable Substrates in the Indoor Environment	Depends on genus. Wood products
Water Activity	Unknown.
Mode of Dissemination	Forcible ejection. Wind currents.
Allergic Potential	Type I allergies (hay fever, asthma) . Type III (hypersensitivity pneumonitis)
Potential or Opportunistic Pathogens	Depends on genus.
Industrial Uses	Edible mushrooms are used in the food industry.
Potential Toxins Produced	Amanitins. monomethyl-hydrazine. muscarine. ibotenic acid. psilocybin.
Other Comments	Basidiospores are the result of sexual reproduction and formed on a structure called the basidium. Basidiospores belong to the members of the Phylum Basidiomycota, which includes mushrooms, shelf fungi, rusts, and smuts.

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CLADOSPORIUM

Natural Habitat	Dead plant matter. Straw. Soil. Woody plants
Suitable Substrates in the Indoor Environment	Fiberglass duct liner. Paint. Textiles. Found in high concentration in water-damaged building materials.
Water Activity	Aw 0.84-0.88
Mode of Dissemination	Air
Allergic Potential	Type I (asthma and hay fever).
Potential or Opportunistic Pathogens	Edema. keratitis. onychomycosis. pulmonary infections. Sinusitis.
Industrial Uses	Produces 10 antigens.
Potential Toxins Produced	Cladosporin and Emodin.

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GANODERMA

Natural Habitat	Grows on conifers and hardwoods worldwide, causing white rot, root rot, and stem rot.
Suitable Substrates in the Indoor Environment	Unknown.
Water Activity	Unknown.
Mode of Dissemination	Wind.
Allergic Potential	Ganoderma species are known to cause allergies in people on a worldwide scale.
Potential or Opportunistic Pathogens	Unknown.
Industrial Uses	Biopulping of wood for the paper industry. Potential medicinal use due to: 1. Inhibition of Ras dependent cell transformation, 2. Antifibrotic activity, 3. Immunomodulating activity, 4. Free-radicle scavenging
Potential Toxins Produced	Unknown.
Other Comments	Used in traditional Chinese medicine as an herbal supplement. It is also known as a "shelf fungus" because the fruiting body forms a stalk-less shelf on the sides of trees and logs. It is sometimes called “artists conk” because when you scratch the white pores of the fruiting body, the white rubs away and exposes the brown hyphae underneath. Thus, pictures can be produced on the fruiting body.
Reference	References: Craig, R.L., Levetin, E. 2000. Multi-year study of Ganoderma aerobiology. Aerobiologia 16: 75-81. http://www.pfc.forestry.ca/diseases/CTD/Group/Heart/heart6_e.html

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PITHOMYCES	
Natural Habitat	A worldwide saprophytic fungi, being isolated from dead plant material and soil.
Suitable Substrates in the Indoor Environment	Paper
Water Activity	Requires high moisture for spore germination
Mode of Dissemination	Wind
Allergic Potential	Unknown
Potential or Opportunistic Pathogens	Mycosis in immunocompromised patients
Industrial Uses	
Potential Toxins Produced	
Other Comments	
Reference	

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5. References and Informational Links

Books

- Bioaerosols: Assessment and Control. Janet Macher, Ed., American Conference of Governmental Industrial Hygienists, Cincinnati, OH 1999.
- Exposure Guidelines for Residential Indoor Air Quality. Environmental Health Directorate, Health Protection Branch, Health Canada, Ottawa, Ontario, 1989.
- Fungal Contamination in Public Buildings: Health Effects and Investigation Methods. Health Canada, Ottawa, Ontario, 2004.
- IICRC: S500 Standard and Reference Guide for Professional Water Damage Restoration. 3rd Edition, Institute of Inspection, Cleaning, and Restoration Certification, Vancouver, WA, 2006
- IICRC: S520 Standard and Reference Guide for Professional Mold Remediation. 1st Edition, Institute of Inspection, Cleaning, and Restoration Certification, Vancouver, WA, 2004
- Field Guide for the Determination of Biological Contaminants in Environmental Samples. 2nd Edition, American Industrial Hygiene Association, 2005.

Consumer Links

- Read the full text of AIHA's "The Facts About Mold" consumer brochure.
  http://www.aiha.org/news-pubs/newsroom/Documents/Facts%20about%20mold.pdf
- The Occupational Safety and Health Administration (OSHA)
  http://www.osha.gov/SLTC/molds/index.html
- CDC Mold Facts
  http://www.cdc.gov/mold/faqs.htm
- CDC Stachybotrys - Questions and answers on Stachybotrys chartarum and other molds
  http://www.cdc.gov/mold/stachy.htm
- IOM, NAS: Clearing the Air: Asthma and Indoor Air Exposures
  http://fermat.nap.edu/books/0309064961/html/index.html
- National Library of Medicine-Mold website
  http://www.nlm.nih.gov/medlineplus/molds.html
- California Department of Health Services (CADOHS)

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http://www.cal-iaq.org/mold/about-mold

- Minnesota Department of Health
  http://www.health.state.mn.us/divs/eh/indoorair/mold/index.html

- New York City Department of Health and Mental Hygiene
  http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml

- H.R.: The United States Toxic Mold Safety and Protection Act
  http://conyers.house.gov/index.cfm?FuseAction=Issues.Home&Issue_id=061bf20d-19b9-b4b1-12a3-6089055e7c99

EPA

- "Should You Have the Air Ducts in Your Home Cleaned?"

  http://www.epa.gov/iaq/pubs/flood.html

- General information about molds and actions that can be taken to clean up or prevent a mold problem.
  http://www.epa.gov/asthma/molds.html

- "A Brief Guide to Mold, Moisture, and Your Home" - Includes basic information on mold, cleanup guidelines, and moisture and mold prevention.
  http://www.epa.gov/iaq/molds/moldguide.html

- "Mold Remediation in Schools and Commercial Buildings" - Information on remediation in schools and commercial property, references for potential mold and moisture remediators.
  http://www.epa.gov/mold/mold_remediation.html

FEMA

- "Homes That Were Flooded May Harbor Mold Problems" - Information and tips for cleaning mold.
  http://www.fema.gov/diz01/d1364n18.shtm

- "Dealing With Mold & Mildew in Your Flood Damaged Home.
  http://www.fema.gov/pdf/rebuild/recover/fema_mold_brochure_english.pdf

- "Prompt Flood Cleanup Can Help Prevent Health Problems" - How to clean up in-house

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EMSL Order: 131104523
Customer ID: AXIO80
Collected:
Received: 9/20/2011
Analyzed: 9/27/2011

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mold problems (not large or serious exposures).
http://www.fema.gov/news/newsrelease.fema?id=9538

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6. Important Terms, Conditions, and Limitations

A. Sample Retention

Samples analyzed by EMSL will be retained for 60 days after analysis date Storage beyond this period is available for a fee with written request prior to the initial 30 day period. Samples containing hazardous/toxic substances which require special handling will be returned to the client immediately. EMSLreserves the right to charge a sample disposal fee or return samples to the client.

B. Change Orders and Cancellation

All changes in the scope of work or turnaround time requested by the client after sample acceptance must be made in writing and confirmed in writing by EMSL. If requested changes result in a change in cost the client must accept payment responsibility. In the event work is cancelled by a client, EMSL will complete work in progress and invoice for work completed to the point of cancellation notice. EMSL is not responsible for. holding times that are exceeded due to such changes.

C. Warranty

EMSL warrants to its clients that all services provided hereunder shall be performed in accordance with established and recognized analytical testing procedures and with reasonable care in accordance with applicable federal, state and local laws. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied. EMSL disclaims any other warranties, express or implied, including a warranty of fitness for particular purpose and warranty of merchantability.

D. Limits of Liability

In no event shall EMSL be liable for indirect, special, consequential, or incidental damages, including, but not limited to, damages for loss of profit or goodwill regardless of the negligence (either sole or concurrent) of EMSL and whether EMSL has been informed of the possibility of such damages, arising out of or in connection with EMSL's services thereunder or the delivery, use, reliance upon or interpretation of test results by client or any third party. We accept no legal responsibility for the purposes for which the client uses the test results. EMSL will not be held responsible for the improper selection of sampling devices even if we supply the device to the user. The user of the sampling device has the sole responsibility to select the proper sampler and sampling conditions to insure that a valid sample is taken for analysis. Any resampling performed will be at the sole discretion of EMSL, the cost of which shall be limited to the reasonable value of the original sample delivery group (SDG) samples. In no event shall EMSL be liable to a client or any third party, whether based upon theories

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of tort, contract or any other legal or equitable theory, in excess of the amount paid to EMSL by client thereunder.

E. Indemnification

Client shall indemnify EMSL and its officers, directors and employees and hold each of them harmless for any liability, expense or cost, including reasonable attorney's fees, incurred by reason of any third party claim in connection with EMSL services, the test result data or its use by client

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Appendix E

Site Photographs
(As of September 15, 2011)

Appendix C
Site Photographs
(As of September, 15, 2011)

Building #678

Second Floor;
Hallway Utility Closet

Unit 28; Kitchen

Second Floor;
Laundry Room