



BOILER SCHEDULE											
MARK	TYPE	FUEL	EWT/LWT	INPUT (MBH)	GROSS OUTPUT (MBH)	GAS INLET PRESSURE (IN. WC)	WATER PD AT ACTUAL GPM	BOILER FLOW RATE(GPM)	VOLTAGE	PHASE	REMARKS
B-1	CONDENSING	NATURAL GAS	60 DEG. F/80 DEG. F	1500	1402	4"	6 FT	90	120 V	1	ALL LISTED
B-2	CONDENSING	NATURAL GAS	60 DEG. F/80 DEG. F	1500	1402	4"	6 FT	90	120 V	1	ALL LISTED

REMARKS:

- EFFICIENCY AS DETERMINED BY BTS-2000 STANDARD.
- BOILERS SHALL OPERATE IN LEADLAG.
- BOILERS SHALL BE CONTROLLED BY BOILER PLANT CONTROLLER, WHICH SHALL COMMUNICATE TO BAS FOR SELECT INPUT/OUTPUT DATA. BOILER PLANT CONTROLLER MAY BE SEPARATE OR INTEGRAL PART OF BOILER CONTROLS.
- FLUE VENT SHALL BE CATEGORY IV TYPE (CONDENSING, POSITIVE PRESSURE), AL294C SS. COMBUSTION AIR SHALL BE INSULATED PVC. BOTH SHALL TERMINATE TO OUTSIDE OF BUILDING.
- MAINTAIN MANUFACTURERS RECOMMENDED CLEARANCES.
- MONO-NITROGEN OXIDE (NOX) PRODUCTION SHALL BE LESS THAN 20 PARTS PER MILLION CORRECTED TO 3% OXYGEN LEVEL.
- COORDINATE ACTUAL CONSTRUCTION WITH INTAKE AND EXHAUST DUCTS.
- COORDINATE CLEARANCE WITH MANUFACTURER INSTRUCTIONS AND ACTUAL MECHANICAL ROOM LAYOUT.
- PROVIDE WITH MANUFACTURER'S SAFETY RELIEF VALVE.
- UNIT SHALL HAVE SINGLE POINT POWER CONNECTION, 120V/60HZ, 25 AMPS.
- PROVIDE CONDENSATE TRAP SIZED FOR 60 GALLONS PER HOUR FOR EACH BOILER.
- COORDINATE MINIMUM FLOW THROUGH BOILER WITH SELECTION OF BOILER PUMP.
- PROVIDE MANUFACTURERS RECOMMENDED CONDENSATE NEUTRALIZATION KIT AND CONDENSATE PIPING, PIPE TO NEAREST FLOOR DRAIN.

COOLING TOWER SCHEDULE																			
MARK	CAPACITY (TONS)	FLOW RATE (GPM)	MAX P.D. (PSI)	EWT/LWT (DEG. F)	AMBIENT WB TEMP (DEG. F)	FAN HP	ELECTRICAL				DIMENSIONS H"XW"XL"	OPERATION WEIGHT (LBS.)	REMARKS	SOUND DATA					
							MCA	MOCP	VOLTAGE	PHASE				SPL DBA	END	MTR SIDE	END	OPP. MTR. SIDE	TOP
CC-1	268.75	500	2.2	100/85	78	7.5	18 A	25 A	460 V	3	181.375x101.5x125.5	8,690	ALL	68	68	69	68	68	68

FAN SCHEDULE															
MARK	SERVICE	TYPE	CFM	TOTAL STATIC PRESS. (" WG)	RPM	HP	VOLTAGE	PHASE	DRIVE TYPE	STARTER	TYPE OF CONTROL	MAX SONES	MAX DBA	WEIGHT (LBS)	REMARKS
EF-1	FUME HOOD EXHAUST	ROOF CENTRIFUGAL	900	1	1725	0.5	208 V	1	DIRECT	YES	INTERLOCK	12	62	75	1,4,6,7,8
EF-2	CHEMICAL STORAGE EXHAUST	ROOF CENTRIFUGAL	250	0.5	1725	0.167	208 V	1	DIRECT	YES	INTERLOCK	8	55	50	1,6,7,8
EF-3	RECEIVING & INSPECTION	ROOF CENTRIFUGAL	475	0.5	1725	0.167	208 V	1	DIRECT	YES	INTERLOCK	8	55	50	1,2,5,6,7
EF-4	DISHWASHER	ROOF CENTRIFUGAL	510	0.5	1725	0.167	208 V	1	DIRECT	YES	INTERLOCK	8	55	50	1,6,7
EF-5	KITCHEN EXHAUST	ROOF UPPLAST CENTRIFUGAL	3800	1	1725	2	208 V	1	BELT	YES	VAV	24	75	110	1,6,7,8,9
EF-6	JANITOR & CAN WASH	ROOF CENTRIFUGAL	225	0.5	1725	0.167	208 V	1	DIRECT	YES	INTERLOCK	8	55	50	1,6,7
EF-7	FIELD HOUSE RESTROOMS	ROOF CENTRIFUGAL	450	0.5	1725	0.167	208 V	1	DIRECT	YES	OCCUPANCY SENSOR	8	55	50	1,6,7
EF-8	FIELD HOUSE RESTROOMS	ROOF CENTRIFUGAL	350	0.5	1725	0.167	208 V	1	DIRECT	YES	LINE VOLTAGE THERMOSTAT	8	55	50	1,3,6
EF-9	FIELD HOUSE STORAGE	ROOF CENTRIFUGAL	150	.25	1725	0.0125	208 V	1	DIRECT	YES	LINE VOLTAGE THERMOSTAT	3	55	40	1,3,6

REMARKS:

- PROVIDE WITH MANUFACTURER'S INTEGRAL DISCONNECT SWITCH.
- PROVIDE WITH ADJUSTABLE DISCHARGE GRILLE.
- PROVIDE WITH WALL MOUNTED THERMOSTAT. INTERLOCK ON/OFF CONTROL.
- INTERLOCK WITH FUME HOOD SWITCH.
- INTERLOCK WITH EXTERIOR DOOR CONTACT, ON WHEN OPEN.
- PROVIDE 18" TALL INSULATED ROOF CURB. COORDINATE WITH ROOF SLOPE.
- FAN (INCLUDING HOUSING) SHALL BE ALL ALUMINUM CONSTRUCTION.
- PROVIDE WITH PRE-WIRED MOTORIZED INTAKE DAMPER AT INTAKE HOOD. FULLY MODULATING FAN AND STAINLESS STEEL BURNER AND GAS VALVE (001 TURNDOWN) WITHIN PARAMETERS SCHEDULED. MAIN OPERATING VALVE, ADJUSTABLE PILOT VALVE AND SAFETY VALVES, SOLID STATE IGNITION CONTROLS, HIGH TEMPERATURE LIMIT SWITCH, UNIT SAFETIES AND SAFEGUARDS, FILTERS, INTEGRAL ELECTRONIC ADJUSTABLE DISCHARGE AIR TEMPERATURE CONTROL SYSTEM.
- PROVIDE WITH AIR DRIED PHENOLIC COATING AS WELL AS AMCA-B AND EXPLOSION RESISTANT MOTORS. THE FAN AND MOTOR SHALL BE INTRINSICALLY SAFE AND SHALL PRODUCE NO SPARKS. FAN CONSTRUCTION SHALL BE 100% NON-FERROUS.
- PROVIDE VARIABLE FLOW SYSTEM INTERLOCKED WITH KITCHEN MAKE-UP AIR UNIT. REFER TO KITCHEN MAKE-UP AIR/EXHAUST FAN CONTROL SEQUENCE ON SHEET M807 FOR ADDITIONAL INFORMATION.

GAS-FIRED MAKEUP AIR UNIT SCHEDULE																			
MARK	SERVICE	TYPE	LOCATION	CONFIGURATION	NOM. SIZE LxWxH (IN.)	WEIGHT (LBS)	CFM	E.S.P (IN WG)	MAX gBA	FUEL TYPE	DIRECT FIRED GAS HEATING				ELECTRICAL CONNECTION			REMARKS	
											INPUT MBH	OUTPUT MBH	TEMP. RISE	MAX INLET PRESSURE	VFD	HP	VOLT.		PH.
MUA-1	KITCHEN HOOD	INDIRECT GAS-FIRED	ROOF	SEE PLAN	156"x45"x45"	1,275	3,000	1.0	62	NATURAL GAS	250.0	200.0	62°	1/2	Yes	2	208 V	3	ALL

REMARKS:

- UNIT TO BE PROVIDED WITH VAV CONTROL SYSTEM. REFER TO KITCHEN MAKE-UP AIR/EXHAUST FAN CONTROL SEQUENCE ON SHEET M807 FOR ADDITIONAL INFORMATION.
- ALL COMPONENTS SHALL BE UL LISTED. PROVIDE WITH DOWN DISCHARGE (FRONT DISCHARGE NOT ALLOWED).
- PROVIDE WITH PRE-WIRED MOTORIZED INTAKE DAMPER AT INTAKE HOOD. FULLY MODULATING FAN AND STAINLESS STEEL BURNER AND GAS VALVE (001 TURNDOWN) WITHIN PARAMETERS SCHEDULED. MAIN OPERATING VALVE, ADJUSTABLE PILOT VALVE AND SAFETY VALVES, SOLID STATE IGNITION CONTROLS, HIGH TEMPERATURE LIMIT SWITCH, UNIT SAFETIES AND SAFEGUARDS, FILTERS, INTEGRAL ELECTRONIC ADJUSTABLE DISCHARGE AIR TEMPERATURE CONTROL SYSTEM.

GLYCOL MAKE-UP UNIT					
MARK	INLET/OUTLET SIZE	GALLONS	MAX WPD (FT)	VOLTAGE	PHASE
GM-1	2"	30	5	115 V	1

HEAT EXCHANGER SCHEDULE											
MARK	SIZE (LxWxH)	HOT SIDE CAPACITY				COLD SIDE CAPACITY				FOULING FACTOR	REMARKS
		GPM	EWT/LWT	PD (PSI)	CAPACITY (MBH)	GPM	EWT/LWT	PD (PSI)	CAPACITY (MBH)		
HX-1	63"x26"x93"	500	102/87	10	3,725	500	85/100	10	3,725	.001	ALL

REMARKS:

- UNIT SHALL BE AHRI CERTIFIED.

EXPANSION TANK SCHEDULE					
MARK	TYPE	SERVICE	TANK VOLUME (GAL.)	ACCEPTABLE VOLUME (GAL.)	PHYSICAL SIZE
ET-1	VERTICAL BLADDER TYPE	CONDENSER LOOP	77.0	34.0	52"H X 24" DIA.
ET-2	VERTICAL BLADDER TYPE	DUAL TEMP. LOOP	33.6	11.3	45"H X 16" DIA.
ET-3	VERTICAL BLADDER TYPE	DOMESTIC HOT WATER LOOP	21.7	11.3	16"H X 20" DIA.

REGISTERS, GRILLES, AND DIFFUSERS												
MARK	TYPE	GRILLE SIZE	PANEL SIZE	INLET DUCT SIZE	BRANCH DUCT SIZE	CFM	P.D.	NOISE CRITERIA	THROW PATTERN	REMARKS		
E-1	ALUMINUM 1/2" EGG CRATE	12"x12"	24"x24"	22"x22"	6" DIA.	0-100	.05	25	-	1,2		
E-1A	ALUMINUM 1/2" EGG CRATE	12"x12"	12"x12"	15"x15"	6" DIA.	0-100	.05	25	-	1,2		
E-2	ALUMINUM 1/2" EGG CRATE	15"x15"	24"x24"	22"x22"	8" DIA.	101-225	.05	25	-	1,2		
E-3	ALUMINUM 1/2" EGG CRATE	18"x18"	24"x24"	22"x22"	10" DIA.	216-400	.05	25	-	1,2		
E-4	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	12" DIA.	401-600	.05	25	-	1,2		
E-5	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	14" DIA.	601-1000	.05	25	-	1,2		
E-6	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	16" DIA.	1000-1400	.05	25	-	1,2		
E-7	ALUMINUM PERFORATED GRILLE	18"x18"	24"x24"	22"x22"	10" DIA.	216-400	.05	25	-	1,2		
E-8	HEAVY DUTY STEEL SIDEWALL GRILLE	44"x24"	46"x26"	44"x24"	-	2000-2730	.05	20	30 DEGREE	1,2		
E-9	LINEAR SLOT DIFFUSER	3 - 1" SLOT	-	-	12" DIA.	75 CFM/FT.	.05	25	-	1,2		
E-10	ALUMINUM SIDEWALL GRILLE	36"x12"	36"x12"	36"x12"	-	1000	.05	25	30 DEGREE	1,2		
E-11	HEAVY DUTY STEEL SIDEWALL GRILLE	8"x6"	10"x8"	-	-	0-100	.05	25	-	1,2		
R-1	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	6" DIA.	0-100	.05	25	-	1,2		
R-1A	ALUMINUM 1/2" EGG CRATE	12"x12"	12"x12"	12"x12"	6" DIA.	0-100	.05	25	-	1,2		
R-2	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	8" DIA.	101-225	.05	25	-	1,2		
R-3	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	10" DIA.	226-400	.05	25	-	1,2		
R-4	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	12" DIA.	401-600	.05	25	-	1,2		
R-5	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	14" DIA.	601-1000	.05	25	-	1,2		
R-6	ALUMINUM PERFORATED GRILLE	22"x22"	24"x24"	22"x22"	14" DIA.	601-1000	.05	25	-	1,2		
R-7	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	22"x22"	16" DIA.	1000-1400	.05	25	-	1,2		
R-9	ALUMINUM LOUVERED RETURN GRILLE; 1/2" SPACING	24"x16"	26"x18"	24"x16"	-	800	.05	15	35 DEGREE	1,2		
R-10	HEAVY DUTY STEEL SIDEWALL GRILLE	8"x6"	10"x8"	-	-	0-100	.05	25	-	1,2		
R-11	ALUMINUM SIDEWALL GRILLE	24"x12"	26"x14"	24"x12"	24"x12"	800	.05	20	DOUBLE DEFLECTION	1,2		
R-12	ALUMINUM SIDEWALL GRILLE	34"x30"	36"x32"	34"x30"	34"x30"	2000	.05	20	DOUBLE DEFLECTION	1,2,6		
R-13	ALUMINUM SIDEWALL GRILLE	34"x52"	36"x54"	34"x52"	34"x52"	4000	.05	20	DOUBLE DEFLECTION	1,2		
S-1	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	12"x12"	24"x24"	6" DIA.	6" DIA.	0-100	.05	25	4-WAY	1,2,3		
S-1A	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	12"x12"	12"x12"	6" DIA.	6" DIA.	0-100	.05	25	4-WAY	1,2,3		
S-2	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	15"x15"	24"x24"	8" DIA.	8" DIA.	101-215	.05	25	4-WAY	1,2,3		
S-3	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	18"x18"	24"x24"	10" DIA.	10" DIA.	216-400	.05	25	4-WAY	1,2,3		
S-4	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	22"x22"	24"x24"	12" DIA.	12" DIA.	401-600	.05	25	4-WAY	1,2,3		
S-5	ALUMINUM SPIRAL DUCT MOUNTED DIFFUSER	18"x12"	18"x12"	-	-	800	.05	25	-	1,2,4,5		
S-6	HEAVY DUTY STEEL SIDEWALL GRILLE	44"x24"	46"x26"	44"x24"	-	2000-3000	.05	20	-	1,2		
S-7	(3) 8" NOZZLE DIFFUSER	34"x12"	36"x14"	34"x12"	34"x12"	800	.12	20	-	1,2		
S-8	ALUMINUM SIDEWALL GRILLE	24"x12"	26"x14"	24"x12"	24"x12"	800	.05	20	DOUBLE DEFLECTION	1,2		
S-9	LINEAR SLOT DIFFUSER	3 - 1" SLOT	SEE DWGS.	-	12" DIA.	75 CFM/FT.	.05	20	-	1,2,4,5		
S-10	ALUMINUM SIDEWALL GRILLE	8"x6"	10"x8"	8"x6"	8"x6"	0-100	.05	25	-	1,2		
S-13	ALUMINUM PERFORATED SQUARE DIFFUSER	18"x18"	24"x24"	10" DIA.	10" DIA.	216-400	.05	25	-	1,2		
S-14	ALUMINUM SIDEWALL GRILLE	36"x12"	36"x12"	36"x12"	36"x12"	0-1375	.05	25	-	1,2		
S-15	ALUMINUM ADJUSTABLE SQUARE DIFFUSER	22"x22"	24"x24"	22"x22"	16" DIA.	1001-1400	.05	25	-	1,2,3		
T-1	ALUMINUM 1/2" EGG CRATE	22"x22"	24"x24"	-	8x8	-	.05	25	-	1,2		

REMARKS:

- CUSTOM COLOR TO BE SELECTED BY ARCHITECT. REFER TO INTERIORS DRAWINGS FOR ADDITIONAL INFORMATION.
- COORDINATE MOUNTING TYPE (LAY-IN, GYP BOARD, ETC.) WITH ARCHITECTURAL DRAWINGS.
- PROVIDE OPTIONAL AIR ADJUSTER FLAPS/AIR PATTERN DEFLECTORS.
- PROVIDE WITH 18 FEET VERTICAL THROW AT 50 FPM UNLESS OTHERWISE NOTED. SUBMIT THROW DATA WITH SHOP DRAWINGS.
- PROVIDE WITH ADJUSTABLE BLADES.
- PROVIDE FRAMELESS GRILLE OPTION.

CIRCULATION FAN SCHEDULE							
MARK	TYPE	FLA	VOLTAGE	PHASE	WEIGHT	REMARKS	
CF-1	14 FT. DIAMETER	10 A	120 V	1	100	1,2,3,4,5	
CF-2	14 FT. DIAMETER	10 A	120 V	1	100	1,2,3,4,5	
CF-3	14 FT. DIAMETER	10 A	120 V	1	100	1,2,3,4,5	

REMARKS:

- COLOR SELECTED BY ARCHITECT.
- PROVIDE EXTENSION TUBE AND MOUNTING BRACKET PER MANUFACTURERS RECOMMENDATION.
- PROVIDE PERMANENT MAGNET DIRECT DRIVE MOTOR.
- PROVIDE LOCAL SPEED CONTROL AND NECESSARY NETWORK CARD TO INTERCONNECT WITH BUILDING DDC SYSTEM FOR OCCUPIED/UNOCCUPIED CONTROL.
- PROVIDE WALL MOUNTED CONTROL PAD FULLY INTEGRATED WITH THE ONBOARD CONTROL.
- FANS TO BE CONTROLLED VIA THE BMS.

APPR. DATE

SYN. DESCRIPTION




**EWING COLE**  
Federal Reserve Bank Building  
100 North 6th Street  
Philadelphia, PA 19106-1500  
Tel: 215-923-2020 Fax: 215-574-0592

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENG/ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON DODEA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

MECHANICAL SCHEDULES

SCALE:

PROJECT NO.: P-021

CONSTR. CONTR. NO. W91236-15-C-0023

NAVFAC DRAWING NO. 13091267

SHEET 513 OF 789

M701

DRAWING REVISION: 10 MARCH 2009

OUTSIDE AIR HANDLING UNIT SCHEDULE

Table with columns for MARK, SERVICE, TYPE, LOCATION, CONFIGURATION, NOM. SIZE, WEIGHT, SUPPLY AIR FAN, RETURN AIR FAN, CHILLED WATER COIL, TOTAL COOLING CAP., SENSIBLE COOLING CAP., EAT (DB/WB), LAT (DB/WB), EWT/LWT, MAX FACE VELOCITY, MAX. AIR PRESSURE DROP, WATER FLOW RATE, MAX. WATER PRESSURE DROP, COIL ROWS/NO. OF COILS, FIN SPACING.

Table with columns for MARK, TOTAL HEATING CAP., EAT (F), LAT (F), EWT/LWT, MAX. FACE VELOCITY, MAX. AIR PRESSURE DROP, WATER FLOW RATE, MAX. WATER PRESSURE DROP, INTERNAL FACE & BYPASS, BYPASS CFM, COIL ROWS/NO. OF COILS, FIN SPACING, TYPE, EFFICIENCY/TEST METHOD, MAX. VELOCITY, SIZE, RESISTANCE, ELECTRICAL, PRESSURE DROP, EFFECTIVENESS, REMARKS.

REMARKS:

- 1. ENTIRE UNIT SHALL BE DOUBLE WALL CONSTRUCTION.
2. SUPPLY STAINLESS STEEL IAO CONDENSATE DRAIN PAN. ENTIRE PAN SHALL BE PITCHED TO OUTLET.
3. PROVIDE STAINLESS STEEL CHILLED WATER COIL CASING.
4. PROVIDE WITH HIGH EFFICIENCY VFD OUTSIDE AIR AND EXHAUST AIR FAN MOTORS.
5. PROVIDE 6" BASE RAIL UNDER ENTIRE PERMETER OF UNITS.
6. PROVIDE INTEGRAL STARTER AND DISCONNECT FOR THE ENERGY RECOVERY WHEEL MOTOR.
7. PROVIDE INTEGRAL VFDs AND DISCONNECTS FOR ALL SUPPLY AND RETURN FAN MOTORS.
8. PERFORMANCE BASED ON 35% PROPYLENE GLYCOL SOLUTION.
9. PROVIDE WITH DUCT SMOKE DETECTOR.

SPLIT SYSTEM INDOOR UNIT SCHEDULE

Table with columns for MARK, QTY, NOM. SIZE, WEIGHT, CFM, ELECTRICAL, PHASE, REMARKS.

REMARKS:

- 1. UNIT SHALL BE MOUNTED ABOVE THE DOOR FRAME. INSTALL WITH MANUFACTURER'S RECOMMENDED CLEARANCES.
2. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
3. PROVIDE WITH FILTERS.
4. PROVIDE WITH UL LISTING.
5. PROVIDE WITH INTEGRAL CONDENSATE PUMP AND OVERFLOW SAFETY INTERLOCK.
6. PROVIDE WITH WALL MOUNTED THERMOSTAT. HAND-HELD OR REMOTE THERMOSTAT ARE UNACCEPTABLE.
7. DISCONNECTS SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR.

SPLIT SYSTEM OUTDOOR UNIT SCHEDULE

Table with columns for MARK, QTY, NOM. SIZE, WEIGHT, TOTAL COOLING CAP., SENSIBLE COOLING CAP., HEATING CAPACITY, MINIMUM SEER, MCA, MOP, VOLTAGE, PHASE, REMARKS.

REMARKS:

- 1. PROVIDE WITH LOW AMBIENT CONTROL DOWN TO 0 DEG F AND HAIL GUARDS.
2. PROVIDE WITH R-410A REFRIGERANT AND SIGHT GLASS, EXPANSION DEVICE, LINE DRIER. SIZE LINES AND PROVIDE INTERMEDIATE TRAPS PER MANUFACTURER'S INSTRUCTION.
3. PROVIDE WITH UL LISTING.
4. DISCONNECTS SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR.

VAV/CAV BOX SCHEDULE

Table with columns for MARK, QTY, BOX TYPE, BOX SIZE, INLET SIZE, TOTAL A.P.D., MAX DISCHARGE NC, MAX RADIATED NC, MAX CFM, MIN. CFM, PRESSURE INDEPENDANT CONTROLS, LEAKAGE RATE @ 2.0" S.P., REMARKS.

REMARKS:

- 1. PROVIDE EACH BOX WITH AN INDEPENDENT DDC CONTROLLER. NO BOX SHALL BE OPERATED BY ANOTHER CONTROLLER LOCATED ON ANOTHER BOX.
2. BOTTOM ACCESS PANEL AND FOIL FACED INSULATION REQUIRED.

WATER SOURCE HEAT PUMP SCHEDULE

Table with columns for MARK, QTY, TYPE, NOM. CFM, EXTERNAL STATIC PRESSURE, GPM, WATER PD, COMPRESSORS, STAGES, WEIGHT (LB), SIZE (LxWxH), ELECTRICAL, HEATING, COOLING, HEAT OF REJECTION, EER @ ARI, CONDENSATE PIPE SIZE, HPS/HPR PIPE SIZE, REMARKS.

REMARKS:

- 1. ALL HEAT PUMP SIZES VHP-12 THRU VHP-60 SHALL BE PROVIDED WITH AN INTEGRAL DISCONNECT. IF A FUSED DISCONNECT IS REQUIRED, MANUFACTURER IS TO PROVIDE ACCORDINGLY. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ELECTRICAL MODIFICATIONS FOR NON-STANDARD BREAKERS.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE DISCONNECTS FOR ALL UNITS LARGER THAN VHP-60.
3. CONTRACTOR SHALL COORDINATE LEFT HAND / RIGHT HAND CONFIGURATIONS. REFER TO HEAT PUMP DETAILS AND FLOOR PLANS FOR ADDITIONAL REQUIREMENTS.
4. MERV-13 FILTERS SHALL BE INSTALLED REMOTELY IN EXTERNAL FILTER RACKS. DO NOT PROVIDE UNITS WITH INTEGRAL FILTERS.
5. PROVIDE WITH FACTORY MOUNTED OR FIELD MOUNTED, WIRED, PROGRAMMED CONTROLLER FOR INTERFACE WITH BUILDING CONTROLS SYSTEM. CONTROLLER MUST BE INSTALLED WITHIN UNIT CABINET. NO EXCEPTIONS.
6. PROVIDE HEAT PUMP WITH STAINLESS STEEL DRAIN PAN, INTEGRAL CONDENSATE P-TRAP AND CONDENSATE OVERFLOW SWITCH.
7. PROVIDE WITH FACTORY START-UP UTILIZING MANUFACTURER'S STANDARD FORMS.
8. PROVIDE UNIT WITH DUCT SMOKE DETECTOR.
9. ALL HEAT PUMPS SHALL HAVE FRONT ONLY ACCESS. REFER TO ENLARGED MECHANICAL ROOM PLANS FOR HEAT PUMP LAYOUT.

Table with columns for DATE, DESCRIPTION, SYM.



EWING COLE
Federal Reserve Bank Building
100 North 6th Street
Philadelphia, PA 19106-1500
Tel: 215-923-2020 Fax: 215-574-0592

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE
CRK LMM/CRK KDM
PRM/M
BRANCH MANAGER
CHIEF ENO ARCH
FIRE PROTECTION

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON
MARINE CORPS BASE QUANTICO, VIRGINIA
QUANTICO, VA
REPLACE QUANTICO M/H SCHOOL
MECHANICAL SCHEDULES

SCALE:
PROJECT NO.: P-021
CONSTR. CONTR. NO.
W91236-15-C-0023
NAVFAC DRAWING NO.
13091268
SHEET 514 OF 789
M702
DRAWING REVISION: 10 MARCH 2009

D

C

B

A

### MANUFACTURED HOOD SCHEDULE

MARK	TYPE	SERVICE	CFM	AIR P.D.	HOOD SIZE (L'XW'XHT')	THROAT SIZE (L'XW')	REMARKS
ILP-2	ALUMINUM INTAKE HOOD	OA-2 INTAKE AIR	6450	0.05	55.75x55.75x21	42X42	ALL
RLP-1	ALUMINUM RELIEF HOOD	OA-1 RELIEF AIR	8800	0.06"	75x76x25	54x42	ALL

- REMARKS:**
- UNIT SHALL BE LOW SILHOUETTE LOUVERED PENTHOUSE.
  - UNIT SHALL BE ALL ALUMINUM.
  - UNIT SHALL BE LINED WITH FIBERGLASS INSULATION TO PREVENT CONDENSATION.
  - PROVIDE WITH BIRDSCREEN.
  - MOUNT UNIT ON ROOF CURB. ROOF CURB SHALL EXTEND 12" ABOVE EXPOSED FINISHED ROOF. CURB SHALL BE INSULATED. VERIFY DIMENSIONS OF ROOF DECK AND INSULATION.
  - COORDINATE WITH ARCHITECTURAL DRAWINGS FOR COLOR. SUBMIT COLOR SAMPLE.
  - THROAT SIZE IS BASED ON 500 FEET PER MINUTE AIR VELOCITY.
  - COORDINATE THROAT SIZE WITH ASSOCIATED MOTORIZED DAMPER.

### LOOP FILTER SCHEDULE

MARK	GPM	FILTER	P.D. (PSI)	SIZE	REMARKS
LF-1	70	50	2.5	15"X15"	ALL
LF-2	25	50	0.8	15"X15"	ALL

- REMARKS:**
- PROVIDE TWO CLEAN FULL SETS OF 50 MICRON FILTERS TO OWNER.

### ELECTRIC HEATER SCHEDULE

MARK	QTY	TYPE/ MOUNTING	DIMENSIONS (WXHXD) IN.	KW	# OF STAGES	ELECTRICAL		REMARKS
						VOLTAGE	PHASE	
EUH-1	5	VERTICAL	14X16X9	5	2	208 V	3	ALL

- REMARKS:**
- PROVIDE WITH INTEGRAL DISCONNECT, OVERLOADS, AND INTEGRAL THERMOSTAT.

### SILENCER SCHEDULE

MARK	DIMENSIONS WxHxL (IN.)	AIRFLOW (CFM)	VELOCITY (FPM)	SILENCER PD (IN WG)	PD INCL. SYS. EFF. (IN WG)	DYNAMIC INSERTION LOSS (dB)							REMARKS	
						63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ		8000 HZ
ST-1	24x42x120	9775	+1396	.17	.24	9	17	23	40	50	41	30	19	2
ST-2	12x42x120	8800	-1257	.06	.06	7	15	11	27	41	37	26	17	2
ST-3	46x16x48	6450	+1262	.05	.16	3	4	8	16	17	14	12	11	1.3
ST-4	34x16x60	2120	+561	.08	.1	5	9	23	39	42	37	24	17	1.3
ST-5	56x20x36	2120	-273	.01	.01	4	7	12	15	15	13	11	9	1.3
ST-6	36x24x60	4000	-667	.02	.07	4	11	16	20	17	14	12	10	1
ST-7	20x20x48	2400	-864	.07	.14	4	6	11	15	24	20	17	15	1.2
ST-8	24x20x48	2000	-864	.07	.14	8	12	22	29	30	23	17	15	1.2
ST-9	20x20x48	1200	-864	.07	.14	11	17	31	38	41	35	23	21	1
ST-10	20x20x36	1200	-864	.07	.14	6	9	14	21	19	15	13	11	1
ST-11	30x20x36	2400	+872	.07	.14	3	3	7	17	23	19	15	13	1
ST-12	30x20x36	2400	-864	.07	.14	7	9	11	18	19	16	13	11	1
ST-13	20x20x48	2400	+872	.07	.14	3	3	7	17	23	19	17	13	1
ST-14	20x20x48	1000	-864	.07	.14	7	13	23	35	44	42	29	27	1
ST-15	20x20x36	1600	-864	.07	.14	7	9	14	21	19	15	13	11	1
ST-16	20x20x36	1400	-864	.07	.14	3	6	9	14	10	9	9	7	1
ST-17	20x20x36	1200	-864	.07	.14	4	7	13	20	27	24	17	14	1
ST-18	20x20x36	1600	-864	.07	.14	6	8	12	18	14	11	11	9	1
ST-19	16x16x36	600	-864	.07	.14	7	9	11	17	19	16	14	11	1
ST-20	16x16x36	800	-864	.07	.14	8	16	25	22	35	35	25	23	1
ST-21	20x20x36	1200	-864	.07	.14	4	5	10	17	23	18	14	11	1
ST-22	20x20x36	1000	+872	.07	.14	3	3	7	13	19	14	12	9	1
ST-23	20x20x36	1200	-864	.07	.14	4	7	13	20	27	24	17	15	1
ST-24	16x16x36	600	-864	.07	.14	3	3	7	17	24	20	15	13	1
ST-25	16x16x36	800	-864	.07	.14	7	9	15	22	20	15	14	12	1
ST-26	20x20x36	1600	-864	.07	.14	4	4	9	13	18	14	12	9	1
ST-27	20x20x36	1600	-864	.07	.14	4	4	9	13	18	14	13	8	1
ST-29	20x20x36	1600	-864	.07	.14	4	4	9	13	18	14	13	11	1
ST-30	20x20x36	1600	-864	.07	.14	1	9	13	19	24	20	16	14	1

- REMARKS:**
- RECTANGULAR MOLDBLOCK.
  - RECTANGULAR ELBOW MOLDBLOCK AND ELBOW SILENCER.
  - PROVIDE WITH HTL CASING. ACOUSTIC MEDIA SHALL BE STANDARD FIBERGLASS WITHOUT FILM LINING.

### WATER-WATER HEAT PUMP SCHEDULE

MARK	QTY	SERVICE	SIZE (LxWxH)	WEIGHT (LB)	ELECTRICAL				COOLING MODE					HEATING MODE					REMARKS				
					VOLTAGE	PHASE	MCA	MOCP	CS/CR EWT (DEG. F)	CS/CR GPM/WPD	CW EWT/LWT (DEG. F)	COOLING CAP. (MBH)	HEAT OF REJECTION (MBH)	EER	CS/CR EWT (DEG. F)	CS/CR GPM/WPD	HW EWT/LWT (DEG. F)	HW GPM/WPD		HEATING CAP. (MBH)	HEAT OF ABSORPTION (MBH)	COP	
WWHP	2	DUAL TEMPERATURE CHW & HW	34"x50"x64"	1750	460 V	3	61 A	80 A	90.0/100.8	75/5'	55.0/46.8	75/5'	304.3	396.2	11.3	50/43.5	75/5'	105.0/114.5	75/5'	349.0	242.1	3.26	ALL

- REMARKS:**
- PERFORMANCE BASED ON 35% PROPOLYENE FLUID ON THE LOAD SIDE.
  - ELECTRICAL CONTRACTOR SHALL PROVIDE DISCONNECTS FOR UNIT.
  - PROVIDE WITH FACTORY START-UP UTILIZING MANUFACTURER'S STANDARD FORMS.
  - UNIT SHALL PRODUCE CHILLED WATER IN COOLING MODE AND HOT WATER IN HEATING MODE.

### PUMP SCHEDULE

MARK	TYPE	SERVICE	GPM	HEAD (FT)	VFD	HP	BRAKE HP	MIN. EFFICIENCY(%)	RPM	VOLTAGE	PHASE	FREQUENCY	REMARKS
P-1	BASE MOUNTED END SUCTION	HEAT PUMP LOOP	690	90	YES	25	19.9	79.6	1750	480 V	3	60	2
P-2	BASE MOUNTED END SUCTION	HEAT PUMP LOOP	690	90	YES	25	19.9	79.6	1750	480 V	3	60	2
P-3	IN-LINE	BOILER	90	20	YES	1	.69	66.79	1750	480 V	3	60	3
P-4	IN-LINE	BOILER	90	20	YES	1	.69	66.79	1750	480 V	3	60	3
P-5	BASE MOUNTED END SUCTION	DUAL TEMPERATURE LOOP	132	50	YES	5	2.67	73.6	1750	480 V	3	60	1.4
P-6	BASE MOUNTED END SUCTION	DUAL TEMPERATURE LOOP	150	50	YES	5	2.67	73.6	1750	480 V	3	60	1.4
P-7	LINESHAFT-VERTICAL TURBINE	COOLING TOWER	500	50	YES	15	8.79	71.8	1750	480 V	3	60	5
P-8	LINESHAFT-VERTICAL TURBINE	COOLING TOWER	500	50	YES	15	8.79	71.8	1750	480 V	3	60	5

- REMARKS:**
- PUMP SELECTED WITH 35% PROPYLENE GLYCOL SOLUTION FLUID.
  - PUMPS P-1 AND P-2 ARE LEADLAG.
  - PUMPS P-3 AND P-4 ARE LEADLAG. PROVIDE VDF'S MOUNTED TO PUMPS FOR BALANCING.
  - PUMPS P-5 AND P-6 ARE LEADLAG.
  - PUMPS P-7 AND P-8 ARE LEADLAG.

### FAN COIL SCHEDULE

MARK	QTY	TYPE	DIMENSIONS (L'XW'XHT')	WEIGHT (LBS)	SUPPLY FAN				COOLING COIL					HEATING COIL					REMARKS					
					NOM. CFM	ESP (IN WC)	DRIVE	MOTOR HP	MCA	MOP	VOLTAGE	PHASE	EAT (DB/WB)	LAT (DB/WB)	COOLING CAPACITY (TOTAL/SENSIBLE) (BTU/H)	EWT/LWT	GPM	WATER PD (FEET)		EAT/LAT DB	HEATING CAPACITY (BTU/H)	EWT/LWT	GPM	WATER PD (FEET)
FCU-1	2	VERTICAL CABINET	76x10x25	213	400	.25	ECM	0.5	2 A	15 A	277 V	1	76/63	56.8/53.9	10,470/8,289	44/54	3.0	4.11	68/87.6	8,350	100/90	1.7	0.35	ALL
FCU-2	5	VERTICAL RECESSED	68x9.25x25	199	600	.25	ECM	0.5	2 A	15 A	277 V	1	76/63	57.0/53.9	15,909/12,489	44/54	4.5	9.60	68/79.2	9,329	100/90	2	.08	ALL
FCU-3	3	HORIZONTAL CABINET	80x36x12	323	600	.5	ECM	0.5	3 A	15 A	277 V	1	76/63	52.7/52	18,889/15,300	44/54	4.5	1.22	68/88	12,989	100/90	2.60	1.51	ALL
FCU-4	1	HORIZONTAL DUCTED	62x30x10	181	800	.5	ECM	0.5	4 A	15 A	277 V	1	76/63	56.1/53.7	21,579/17,450	44/54	6.0	3.62	68/86.3	15,859	100/90	3.2	2.08	ALL

- REMARKS:**
- PROVIDE HIGH EFFICIENCY MOTORS WITH DISCONNECTS AND STARTERS.
  - PROVIDE WITH THREE-SPEED FAN.
  - PROVIDE INTEGRAL THERMOSTAT AND TAMPER PROOF INSTALLATION.
  - PROVIDE WITH MERV 13 FILTER.




**EWING COLE**  
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Tel: 215-923-2020 Fax: 215-574-0952

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APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENO/ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
DOD/EA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

MECHANICAL SCHEDULES

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SCALE: PROJECT NO. P-021  
CONSTR. CONTR. NO. W91236-15-C-0023  
NAVFAC DRAWING NO. 13091269  
SHEET 515 OF 789  
M703

DRAWING REVISION: 10 MARCH 2016

D

C

B

A

CONTROL DAMPER SCHEDULE				
DAMPER SERVICE	DIMENSIONS		FALL POSITION	END SWITCHES REQUIRED
	WIDTH	HEIGHT		
OA-1 UNIT OUTSIDE AIR DAMPER	42"	24"	CLOSE	YES
OA-1 UNIT EXHAUST AIR DAMPER	42"	24"	CLOSE	YES
OA-2 UNIT OUTSIDE AIR DAMPER	46"	16"	CLOSE	YES
OA-2 UNIT EXHAUST AIR DAMPER	46"	16"	CLOSE	YES
KITCHEN MAU-1 ISOLATION EXHAUST DAMPER	30"	14"	CLOSE	YES
EF-1 FUME HOOD EXHAUST DAMPER	10"	10"	CLOSE	NO
EF-2 CHEMICAL STORAGE EXHAUST DAMPER	8"	8"	CLOSE	NO
EF-3 RECEIVING & INSPECTION EXHAUST DAMPER	12"	12"	CLOSE	NO
EF-4 DISHWASHER EXHAUST DAMPER	12"	12"	CLOSE	NO
EF-5 KITCHEN EXHAUST DAMPER	N/A	N/A	N/A	N/A
EF-6 JANITOR & CAN WASH EXHAUST DAMPER	8"	8"	CLOSE	NO
EF-7 FIELD HOUSE RESTROOMS EXHAUST DAMPER	12"	12"	CLOSE	NO
EF-8 FIELD HOUSE STORAGE EXHAUST DAMPER	8"	8"	CLOSE	NO

- REMARKS**
- ALL DAMPERS SHALL BE AMCA STANDARD 511 CLASS 1A, 3 CFM/CQFT AT 1" w.g.
  - ALL DAMPERS SHALL FULLY CLOSE IN 30 SECONDS.
  - ALL DAMPERS SHALL BE ACCESSIBLE FROM ABOVE CEILING.
  - ALL DAMPERS SHALL BE PROVIDED BY CONTROLS CONTRACTOR.

MECHANICAL CONTROL LEGEND			
AFF	ABOVE FINISHED FLOOR	(Ts)	INSERTION TEMPERATURE SENSOR
BAS	BUILDING AUTOMATION SYSTEM	(Cs)	CARBON DIOXIDE SENSOR
CO2	CARBON DIOXIDE	(Os)	OCCUPANCY SENSOR
TCC	TEMPERATURE CONTROL CONTRACTOR	(H)	HUMIDITY SENSOR
DP	DEWPOINT	(LL)	LOW LIMIT TEMPERATURE SENSOR
EA	EXHAUST AIR PATH	(P)	PRESSURE SENSOR
RA	RETURN AIR PATH	(DP)	DUCT STATIC PRESSURE SENSOR
SA	SUPPLY AIR PATH	(DPSW)	DIFFERENTIAL PRESSURE SWITCH
HPS/R	HEAT PUMP WATER SUPPLY/RETURN	(DPS)	DIFFERENTIAL PRESSURE SENSOR
NC	NORMALLY CLOSED	(C)	START/STOP COMMAND
OA	OUTSIDE AIR PATH	(M)	MOTORIZED DAMPER
OCC	OCCUPANCY	(F)	FLOW METER
PRESS	PRESSURE	(CS)	CURRENT SENSOR
DI	DIGITAL INPUT	(SD)	DUCT MOUNTED SMOKE DETECTOR
DO	DIGITAL OUTPUT	(COS)	CONDENSATE OVERFLOW SWITCH
AI	ANALOG INPUT	(DSP-HL)	DUCT STATIC PRESSURE HIGH LIMIT
AO	ANALOG OUTPUT	(DSP-LL)	DUCT STATIC PRESSURE LOW LIMIT
VFD	VARIABLE FREQUENCY DRIVE	(ZN-DP)	ZONE DEW POINT
RH	RELATIVE HUMIDITY	(ZN-CO2)	ZONE CARBON DIOXIDE
MAU	MAKE-UP AIR UNIT	(ZN-OCC)	ZONE OCCUPANCY SENSOR
O/H	OCCUPIED HEATING SETPOINT	(ZN-T)	ZONE TEMPERATURE
O/C	OCCUPIED COOLING SETPOINT	(CO2)	DDC STANDALONE CARBON DIOXIDE SENSOR
U/H	UNOCCUPIED HEATING SETPOINT	(FS)	FLOW SWITCH
U/C	UNOCCUPIED COOLING SETPOINT	(BTU M)	BTU METER
U/C	EMERGENCY HVAC VENTILATION		
(V)	EMERGENCY HVAC VENTILATION KILL BUTTON		
(T)	THERMOSTAT		

BUILDING OCCUPANCY AND SCHEDULE														
	LEARNING STUDIOS		ADMINISTRATION/OFFICES		MULTIPURPOSE/GYM/AUDITORIUM		COMMONS/DINING		INFORMATION CENTER		KITCHEN		CORRIDORS	
WEEKDAYS - MONDAY-FRIDAY	7:30AM-4PM		6AM-5PM		7:30AM-4PM		7:30AM-2:30PM		7:30AM-3:30PM		6AM-2:30PM		7:30AM-4PM	
SET POINTS	O/H:68	O/C:75	O/H:68	O/C:75	O/H:68	O/C:75	O/H: 68	O/C:75	O/H: 68	O/C:75	O/H:68	O/C:75	O/H: 68	O/C:75
WEEKENDS/HOLIDAYS	UNOCCUPIED		UNOCCUPIED		UNOCCUPIED		UNOCCUPIED		UNOCCUPIED		UNOCCUPIED		UNOCCUPIED	
SET POINTS	U/H:65	U/C:80	U/H:65	U/C:80	U/H:65	U/C:80	U/H:65	U/C:80	U/H:65	U/C:80	U/H:65	U/C:80	U/H:65	U/C:80
SUMMER WEEKDAYS	8AM-12PM		8AM-4PM		UNOCCUPIED		8AM-2:30PM		8AM-12PM		6AM-2:30PM		8AM-12PM	
SETPOINTS	O/H:68	O/C:75	O/H:68	O/C:75	U/H:68	U/C:75	O/H: 68	O/C:75	O/H:68	O/C:75	O/H:68	O/C:75	O/H:68	U/C:75

- REMARKS**
- ALL SCHEDULES SHALL BE ADJUSTABLE FROM THE BAS
  - EACH LEARNING STUDIO SHALL BE ON AN INDEPENDENT OCCUPANCY SCHEDULE.
  - OUTSIDE AIR SHALL BE CONTROLLED BY THE OCCUPANCY SCHEDULE AND SHALL BE OFF IN UNOCCUPIED MODE.
  - THE BUILDING WARM UP/COOL DOWN SHALL BE BY INDIVIDUAL ZONES TO PREVENT ALL UNITS FROM BEING ON AT SAME TIME DRIVING UP DEMAND CHARGE. ALL SPACES SHALL BE UP TO TEMPERATURE 30 MINUTES BEFORE OCCUPANCY. THIS SHALL BE TESTED DURING COMMISSIONING.
  - ALL ZONES SHALL HAVE SIMILAR LIGHTING CONTROL SCHEDULES.

**GRAPHIC SCREENS AND TRENDS CONTROLS**

- ALL GRAPHICS SCREENS SHALL BE SUBMITTED FOR REVIEW. PROVIDE THE FOLLOWING ANIMATED, COLOR GRAPHICS SCREENS MINIMALLY:
  - ENTIRE FLOOR PLAN HOME SCREEN WITH OUTSIDE AIR TEMPERATURE, TIME AND DATE DISPLAYS.
  - FLOOR PLAN SHOWING MAJOR ZONES.
  - CLICK MAJOR ZONE DISPLAYS ENLARGED FLOOR PLAN OF THE ZONE SHOWING INDIVIDUAL HEAT PUMP ZONES & NUMBERS. INCLUDE LINK TO RESPECTIVE MECHANICAL ROOM.
  - CLICK INDIVIDUAL ZONE SHOWS HEAT PUMP GRAPHIC. DISPLAY ALL DATA POINTS FROM POINTS LIST. OCC/UNOCC SCHEDULE AND SETPOINTS, VAV CFM AND SETPOINT, OUTSIDE AIR TEMPERATURE, TIME AND DATE.
- COLOR GRAPHIC SCREENS SHALL BE DESIGNED FOR ALL MECHANICAL SYSTEMS AND SHALL INCLUDE THE FOLLOWING:
  - A GRAPHIC SHALL BE THE STARTING PAGE WITH THE BUILDING GRAPHICALLY INDICATED. BREAK UP THE FLOOR PLAN INTO ZONES TO MATCH CONTRACT DOCUMENTS. THE BUILDING SHALL BE THE POINT OF REFERENCE TO ENTER INTO THE RESPECTIVE BUILDING CONTROL SYSTEM.
  - ALL HEAT PUMP UNITS INCLUDING PUMPS, FILTERS, CO2 LEVELS, ASSOCIATED VAV BOXES, ETC.
  - ALL OA UNITS. THE SUMMATION OF ALL SUPPLY OUTSIDE AIR FOR EACH UNIT SHALL BE DISPLAYED ON THE AHU GRAPHIC PAGES
  - SPLIT SYSTEMS
  - WATER-TO-WATER SYSTEMS
  - EXHAUST FANS
  - KITCHEN SYSTEMS
  - ENERGY METERS
  - DOMESTIC HOT WATER HEATERS AND PUMPS.
  - ALL FLOOR PLANS INDICATING ALL ACTUAL ROOM NUMBERS, THERMOSTATS AND MECHANICAL EQUIPMENT. OPERATOR SHALL BE CAPABLE OF CLICKING ON ANY EQUIPMENT AND PULL UP THE RESPECTIVE GRAPHIC SCREEN
- GRAPHICS TO INCLUDE FLOOR PLANS WITH ROOM NUMBERS (AS-BUILT ROOM NUMBERS) AND THERMOSTAT LOCATIONS, LINKS TO FLOW DIAGRAMS FOR HEAT PUMPS, ZONE DAMPERS, HEAT PUMP LOOP SYSTEM, OUTSIDE AIR SYSTEMS, DOMESTIC HOT WATER AND LIGHTING CONTROLS.
  - THE TCC SHALL INCLUDE PROGRAMMING OF 25 POINT TRENDS AS DIRECTED. THESE CAN BE REQUESTED AT ANY TIME DURING THE PROJECT INCLUDING THE WARRANTY PERIOD. TREND CHANGE OF STATE FOR DIGITAL INPUTS, TREND ANALOG POINTS IN 30 MINUTE INCREMENTS. MAINTAIN TREND HISTORY FOR 30 DAYS. INCLUDE THE FOLLOWING:
    - OUTSIDE AIR TEMPERATURE
    - OA UNIT LEAVING AIR TEMPERATURES FOR EACH UNIT
    - SUMMATION OF ALL VAV BOXES CONNECTED TO A UNIT
    - VFD SPEEDS (OA & EA)
    - HEAT PUMP MAIN SUPPLY AND RETURN TEMPERATURES
    - HEAT PUMP MAIN FLOW RATE
    - WATER TO WATER UNIT MAIN SUPPLY AND RETURN TEMPERATURES
    - CRITICAL ROOM SPACE TEMPERATURES
    - DOMESTIC HOT WATER SUPPLY TEMPERATURES
    - FREEZER/COOLER TEMPERATURES (DATA & ELEC. ROOMS)
    - MAKEUP WATER FLOW RATE & PRESSURE
    - ELECTRICAL POWER KW AND KWH
    - OTHER AS DIRECTED IN THE FIELD

APPR

DATE

SYM DESCRIPTION




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AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENR ARCH

FIRE PROTECTION

NAVAL FACILITIES ENGINEERING COMMAND  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

REPLACE QUANTICO M/H SCHOOL

TEMPERATURE CONTROLS LEGEND SHEET

SCALE: 12" = 1'-0"

PROJECT NO.: P-021

CONSTR. CONTR. NO.: W91236-15-C-0023

NAVFAC DRAWING NO.: 13091270

SHEET 516 OF 789

M800

DRAWING REVISION: 10 MARCH 2009



MECHANICAL CONTROLS GENERAL NOTES

- A. DUAL OCCUPANCY SENSOR PROVIDED BY ELECTRICAL CONTRACTOR.
- B. CONTROLS CONTRACTOR PROVIDES ALL NECESSARY RELAYS.
- C. REFER TO SHEETS A111 THROUGH A125 AND ELEVATIONS D-CC, D-COM, AND D-CTRL ON SHEET G005 FOR PLACEMENT OF LIGHT SWITCHES, INTERCOMS, PHONES, CLOCKS, THERMOSTATS, AND CO2 SENSORS.
- D. PROVIDE TAMPER RESISTANT DEVICE COVERS FOR ALL WALL MOUNTED SENSORS AND DEVICES IN PUBLIC AREAS. GYMNASIUM DEVICES SHALL HAVE BALL STRIKE PROTECTION.

TAGGED NOTES

- A15 PROVIDE 4" DRYER EXHAUST AIR DUCT. ROUTE TO ALUMINUM DRYER WALL CAP WITH BACKDRAFT DAMPER. DO NOT INSTALL MORE THAN THREE 90 DEGREE BENDS. REFER TO ARCHITECTURAL ELEVATION DRAWINGS FOR VENT CAP MOUNTING HEIGHT.
- A46 CONTRACTOR SHALL PROVIDE A 1 TON MOBILE HEAT PUMP MOUNTED ON MOBILE PLATFORM TO BE USED FOR EDUCATION PURPOSES. REFER TO ENERGY DASHBOARD DETAILS FOR FURTHER REQUIREMENTS.
- A51 DDC OPERATIONS WORK STATION. REFER TO ARCHITECTURAL DRAWINGS FOR FURNITURE REQUIREMENTS.
- A52 MAIN DDC CONTROL PANEL
- A56 OUTSIDE AIR DAMPER LOCATION. REFER TO AIR DISTRIBUTION PLANS.
- A57 EXHAUST AIR DAMPER LOCATION. REFER TO AIR DISTRIBUTION PLANS.

FIRST FLOOR ZONING PLAN

ZONE	STATS	OA UNIT	OA DUCTED RETURN	ROOMS
A1.1	1	1	YES	STAGE STORAGE, WOMENS DRESSING ROOM, MENS DRESSING ROOM
A1.2	1	1	NO	STAGE
A1.3	1	1	NO	PERFORMANCE
A1.4	1	1	YES	MUSIC, MUSIC LIBRARY, MUSIC PRACTICE, MUSIC STORAGE
A1.5	1	1	NO	MS CTE
A1.6	1	1	NO	ART, KILN, ART STORAGE
A1.7	0	N/A	N/A	MECH 4
A1.8	1	N/A	N/A	STAIR 5
A1.9	1	1	NO	ENTRY CORRIDOR, MS CTE HUB
A1.10	0	N/A	N/A	MECH 1C37
B1.1	1	2	YES	CAREER INFO AREA, REGISTRAR, RECORDS, COUNSELOR, PSYCH, CONF.
B1.2	1	2	YES	CAREER COUNSELOR, ASSESSMENT, ASSESSOR, STORAGE
B1.3	1	2	YES	TREATMENT, NURSE, NURSE WAITING, NURSE TOILET, NURSE SCREENING STORAGE
B1.4	1	2	YES	TR 3, ELEV MACH
B1.5	2	N/A	N/A	COMMONS
B1.6	1	2	NO	STAIR 2
B1.7	1	N/A	N/A	MECH 1
B1.8	0	N/A	N/A	MECH 1
B1.9	1	2	YES	ADMIN CONF, MAIL ROOM, WORK RM, WOMENS TOILET, MENS TOILET, PARENTS CENTER
B1.10	1	2	YES	PRINCIPAL, ASST PRINCIPAL, SMSS, ADMIN CIRC, CLERICAL, RECEPTION
B1.11	1	N/A	N/A	ELEC
B1.12	1	2	YES	ENTRY CORRIDOR
B1.13	0	N/A	N/A	MECH 1A21
C1.1	2	2	NO	GYM
C1.2	1	2	YES	TRAINING ROOM, PE STORAGE, ATHLETIC STORAGE
C1.3	0	N/A	N/A	MECH 1C05
C1.4	0	N/A	N/A	MECH 1C07
D1.1	1	1	NO	HS CHEM
D1.2	2	1	NO	LEARNING STUDIO 1, LEARNING STUDIO 2
D1.3	1	1	NO	HS HUB, HS ONE TO ONE
D1.4	2	1	NO	LEARNING STUDIO 3, LEARNING STUDIO 4
D1.5	1	1	NO	ST COLL HUB, ST COLL WRK, ST COLL STORAGE, MENS TOILET, WOMENS TOILET, KITCHENTTE, CENTRAL WORKRM
D1.6	1	1	NO	FLEX HUB, HS ACADEMIC SUPPORT, MS LI MOD, MS GROUP LEARNING 2, ONE TO ONE, HS GROUP LEARNING
D1.7	2	1	NO	LEARNING STUDIO FLEX 1, LEARNING STUDIO FLEX 2
D1.8	1	N/A	N/A	STAIR 4
D1.9	1	N/A	N/A	TR2
D1.10	0	N/A	N/A	MECH 6
D1.11	0	N/A	N/A	MECH 5
D1.12	1	1	NO	HS PHYSICAL SCIENCE, CHEM, SCI PREP 1
E1.1	2	1	NO	LEARNING STUDIO 5, LEARNING STUDIO 6
E1.2	2	1	NO	LEARNING STUDIO 7, LEARNING STUDIO 8
E1.3	1	1	NO	MS HUB 1
E1.4	1	1	NO	OT/PT GROSS, OT/PT FINE, MS ONE TO ONE 2
E1.5	1	N/A	N/A	FIRE
E1.6	1	N/A	N/A	STAIR 3
E1.7	0	N/A	N/A	MECH 7
E1.8	3	1	NO	KITCHEN
F1.1	1	2	NO	WEIGHT RM, TEAM RM, JANITOR, MENS TOILET, WOMENS TOILET
F1.2	2	2	NO	CENTRAL STORAGE, RECEIVING & INSPECTION RM
F1.3	1	N/A	N/A	ACTIVE COMPUTER (TR1)
F1.4	1	N/A	N/A	ELECTRICAL RM
F1.5	1	2	NO	WOMENS LOCKRM, PE STAFF COLL, AT WORKSPACE
F1.6	1	2	NO	MENS LOCKER RM, ATHLETIC WORKRM, STAFF TOILET
F1.7	1	2	NO	JROTC 1
F1.8	1	2	NO	TEAM STORAGE, ATHLETIC LAUNDRY
F1.9	1	2	NO	JROTC 2, EQUIP STROAGE
F1.10	1	2	YES	JROTC STORAGE, STAFF WORKSPACE, BATTALION HQ
F1.11	0	N/A	N/A	MECH 1C27
G1.1	0	N/A	N/A	TOILET W
G1.2	0	N/A	N/A	TOILET M
G1.3	0	N/A	N/A	FH CONCESSIONS

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C

B

A



1 FIRST FLOOR HVAC CONTROLS - AREA 2  
 1/16" = 1'-0"

APPR

DATE

SYN DESCRIPTION

**EWING COLE**  
 Federal Reserve Bank Building  
 100 North 6th Street  
 Philadelphia, PA 19106-1500  
 Tel: 215-923-2020 Fax: 215-574-0852

AE INFO

APPROVED

FOR COMMANDER NAVFAC  
 ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

NAVAL FACILITIES ENGINEERING COMMAND  
 NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
 DODEA  
 MARINE CORPS BASE QUANTICO, VIRGINIA  
 QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated  
 PROJECT NO.: P-021  
 CONSTR CONTR NO.: W91236-15-C-0023  
 NAVFAC DRAWING NO.: 13091272  
 SHEET 518 OF 789  
 M802

DEPARTMENT OF THE NAVY  
 NAVAL FACILITIES ENGINEERING COMMAND  
 DODEA  
 MARINE CORPS BASE QUANTICO  
 QUANTICO, VA

RTA SUBMISSION - 10/13/2016

DRAWFORM REVISION: 10 MARCH 2009

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MECHANICAL CONTROLS GENERAL NOTES

- A. DUAL OCCUPANCY SENSOR PROVIDED BY ELECTRICAL CONTRACTOR.
- B. CONTROLS CONTRACTOR PROVIDES ALL NECESSARY RELAYS.
- C. REFER TO SHEETS A111 THROUGH A125 AND ELEVATIONS D-CC, D-COM, AND D-CTRL ON SHEET G005 FOR PLACEMENT OF LIGHT SWITCHES, INTERCOMS, PHONES, CLOCKS, THERMOSTATS, AND CO2 SENSORS.
- D. PROVIDE TAMPER RESISTANT DEVICE COVERS FOR ALL WALL MOUNTED SENSORS AND DEVICES IN PUBLIC AREAS. GYMNASIUM DEVICES SHALL HAVE BALL STRIKE PROTECTION.

TAGGED NOTES

- A46 CONTRACTOR SHALL PROVIDE A 1 TON MOBILE HEAT PUMP MOUNTED ON MOBILE PLATFORM TO BE USED FOR EDUCATION PURPOSES. REFER TO ENERGY DASHBOARD DETAILS FOR FURTHER REQUIREMENTS.
- A50 REFER TO SHEET M805 FOR VERTICAL HEAT PUMP LOCATION
- A53 PROVIDE OUTSIDE AIR TEMPERATURE SENSOR ON ROOF AT THE NORTH END OF THE BUILDING.
- A54 OA-1 OUTSIDE AIR STATIC PRESSURE SENSOR LOCATION. REFER TO SHEET MH124.
- A55 OA-1 EXHAUST AIR STATIC PRESSURE SENSOR LOCATION. REFER TO SHEET MH124
- A56 OUTSIDE AIR DAMPER LOCATION. REFER TO AIR DISTRIBUTION PLANS.
- A57 EXHAUST AIR DAMPER LOCATION. REFER TO AIR DISTRIBUTION PLANS.
- A58 HEAT PUMP HYDRONIC SUPPLY STATIC PRESSURE SENSOR LOCATION. REFER TO SHEET MP222 FOR PIPE LOCATION.
- A59 HEAT PUMP HYDRONIC RETURN STATIC PRESSURE SENSOR LOCATION. REFER TO SHEET MP222 FOR PIPE LOCATION.

SECOND FLOOR ZONING PLAN

ZONE	STATS	OA UNIT	OA DUCTED TO RETURN	ROOMS
A2.1	1	1	NO	COMP CENTER
A2.2	1	1	NO	INFO CENTER, CIRCULATION
A2.3	0	N/A	N/A	MECH 2C12
A2.4	1	N/A	N/A	STAIR 5
B2.1	1	1	NO	STAFF COLLABORATION, INFO WORKRM
B2.2	1	1	NO	HS CTE, ELEV
B2.3	1	N/A	N/A	TR5
B2.4	0	N/A	N/A	MECH 2C08
B2.5	1	N/A	N/A	STAIR 2
B2.6	1	1	NO	HS CTE HUB, ENTRY CORRIDOR, VIDEO BROADCASTING
D2.1	1	1	NO	LIMS-TOILET, LIMS-SHOWER, LIMS INSTRUCTIONAL AREA
D2.2	2	1	NO	LEARNING STUDIO 9, LEARNING STUDIO 10
D2.3	2	1	NO	LEARNING STUDIO 11, LEARNING STUDIO 12
D2.4	1	1	NO	HS HUB 2, HS ONE TO ONE, HS GROUP LEARNING 1
D2.5	1	1	NO	ST COLL WORK 2, ST COLL STORAGE, ASAC, MENS TOILET, WOMENS TOILET, KITCHENETTE, CENTRAL WORKRM 2
D2.6	1	N/A	N/A	TR 4
D2.7	1	1	NO	HS LI MILD/MODERATE, MS ACADEMIC SUPPORT 2, HS ACADEMIC SUPPORT 2, MS LEARNING GROUP 1, MS LEARNING GROUP 2, FLEX HUB
D2.8	2	1	NO	LEARNING STUDIO FLEX 3, LEARNING STUDIO FLEX 4
D2.9	0	N/A	N/A	MECH 2E07
D2.10	0	N/A	N/A	MECH 9
D2.11	1	N/A	N/A	STAIR
E2.1	1	1	NO	MS HUB 2
E2.2	2	1	NO	LEARNING STUDIO 13, LEARNING STUDIO 14
E2.3	1	1	NO	MS SCIENCE, SCI PREP 2
E2.4	1	1	NO	READING LAB, MS ONE TO ONE 2
E2.5	2	1	NO	LEARNING STUDIO 15, LEARNING STUDIO 16
E2.6	0	N/A	N/A	MECH 8
E2.7	1	N/A	N/A	STAIR 3



1 SECOND FLOOR HVAC CONTROLS - AREA 1  
1/16" = 1'-0"




**EWING COLE**  
Federal Reserve Bank Building  
100 North 6th Street  
Philadelphia, PA 19106-1500  
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ACTIVITY

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SATISFACTORY TO DATE

CRK LMM/CRK KDM

FRMCM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

---

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
DODEA  
MARINE CORPS BASE QUANTICO, VIRGINIA

**REPLACE QUANTICO M/H SCHOOL**  
QUANTICO, VA

TEMPERATURE CONTROLS SCHEMATICS

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SCALE: As Indicated  
PROJECT NO.: P-021  
CONSTR. CONTR. NO.: W91236-15-C-0023  
NAVFAC DRAWING NO.: 13091273  
SHEET 519 OF 789  
M803

DRAWN BY: [Name] CHECKED BY: [Name] DATE: [Date]

MECHANICAL CONTROLS GENERAL NOTES

- A. DUAL OCCUPANCY SENSOR PROVIDED BY ELECTRICAL CONTRACTOR.
- B. CONTROLS CONTRACTOR PROVIDES ALL NECESSARY RELAYS.
- C. REFER TO SHEETS A111 THROUGH A125 AND ELEVATIONS D-C-C, D-COM, AND D-CTRL ON SHEET G005 FOR PLACEMENT OF LIGHT SWITCHES, INTERCOMS, PHONES, CLOCKS, THERMOSTATS, AND CO2 SENSORS.
- D. PROVIDE TAMPER RESISTANT DEVICE COVERS FOR ALL WALL MOUNTED SENSORS AND DEVICES IN PUBLIC AREAS. GYMNASIUM DEVICES SHALL HAVE BALL STRIKE PROTECTION.

TAGGED NOTES

SECOND FLOOR ZONING PLAN

ZONE	STATS	OA UNIT	OA DUCTED TO RETURN	ROOMS
A2.1	1	1	NO	COMP CENTER
A2.2	1	1	NO	INFO CENTER, CIRCULATION
A2.3	0	N/A	N/A	MECH 2C12
A2.4	1	N/A	N/A	STAIR 5
B2.1	1	1	NO	STAFF COLLABORATION, INFO WORKRM
B2.2	1	1	NO	HS CTE, ELEV
B2.3	1	N/A	N/A	TR5
B2.4	0	N/A	N/A	MECH 2C08
B2.5	1	N/A	N/A	STAIR 2
B2.6	1	1	NO	HS CTE HUB, ENTRY CORRIDOR, VIDEO BROADCASTING
D2.1	1	1	NO	LIMS-TOILET, LIMS-SHOWER, LIMS INSTRUCTIONAL AREA
D2.2	2	1	NO	LEARNING STUDIO 9, LEARNING STUDIO 10
D2.3	2	1	NO	LEARNING STUDIO 11, LEARNING STUDIO 12
D2.4	1	1	NO	HS HUB 2, HS ONE TO ONE, HS GROUP LEARNING 1
D2.5	1	1	NO	ST COLL WORK 2, ST COLL STORAGE, ASAC, MENS TOILET, WOMENS TOILET, KITCHENETTE, CENTRAL WORKRM 2
D2.6	1	N/A	N/A	TR 4
D2.7	1	1	NO	HS LI MILD/MODERATE, MS ACADEMIC SUPPORT 2, HS ACADEMIC SUPPORT 2, MS LEARNING GROUP 1, MS LEARNING GROUP 2, FLEX HUB
D2.8	2	1	NO	LEARNING STUDIO FLEX 3, LEARNING STUDIO FLEX 4
D2.9	0	N/A	N/A	MECH 2E07
D2.10	0	N/A	N/A	MECH 9
D2.11	1	N/A	N/A	STAIR
E2.1	1	1	NO	MS HUB 2
E2.2	2	1	NO	LEARNING STUDIO 13, LEARNING STUDIO 14
E2.3	1	1	NO	MS SCIENCE, SCI PREP 2
E2.4	1	1	NO	READING LAB, MS ONE TO ONE 2
E2.5	2	1	NO	LEARNING STUDIO 15, LEARNING STUDIO 16
E2.6	0	N/A	N/A	MECH 8
E2.7	1	N/A	N/A	STAIR 3

D

C

B

A



1 SECOND FLOOR HVAC CONTROLS - AREA 2  
 1/16" = 1'-0"

APPR

DATE

SYN DESCRIPTION

**EWING COLE**  
 Federal Reserve Bank Building  
 100 North 6th Street  
 Philadelphia, PA 19106-1500  
 Tel: 215-923-2020 Fax: 215-574-0822

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

NAVFAC ENGINEERING COMMAND  
 NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
 DDOEA  
 MARINE CORPS BASE QUANTICO, VIRGINIA  
 QUANTICO, VA

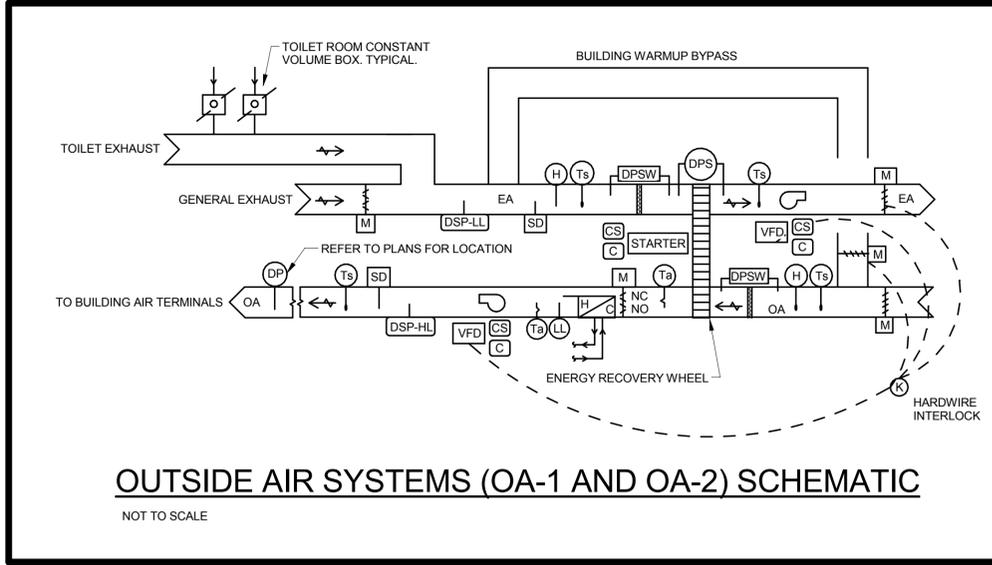
**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated  
 PROJECT NO: P-021  
 CONSTR CONTR NO: W91236-15-C-0023  
 NAVFAC DRAWING NO: 13091274  
 SHEET 520 OF 789  
 M804

DRAWN/FORM REVISION: 10 MARCH 2016

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### OUTSIDE AIR SYSTEMS:

1. THERE ARE TWO OUTSIDE AIR UNITS IN THIS FACILITY.
2. EACH SYSTEM SHALL OPERATE UNDER THE CONTROL OF A LOCAL, STAND-ALONE MICROPROCESSOR BASED DDC CONTROLLER.
3. EACH SYSTEM SHALL BE PLACED INTO THE OCCUPIED/UNOCCUPIED MODE BASED UPON THE USER ADJUSTABLE SCHEDULE AT THE NETWORK CONTROLLER. THESE SYSTEMS SHALL BE IN THE OCCUPIED MODE DURING REGULAR SCHOOL HOURS ONLY. SEE BUILDING OCCUPANCY SCHEDULE.
4. IF COMMUNICATION IS LOST BETWEEN THE NETWORK CONTROLLER AND THE OUTSIDE AIR SYSTEM CONTROLLER, THEN THE OUTSIDE AIR SYSTEM SHALL BE PLACED INTO THE UNOCCUPIED MODE UNTIL COMMUNICATION IS RESTORED.
5. EACH SYSTEM WILL BE PLACED INTO A MODE OF OPERATION BASED UPON THE FOLLOWING ADJUSTABLE TEMPERATURE SCHEDULE:

OUTSIDE AIR TEMPERATURE	MODE OF OPERATION
75 DEG F OR GREATER (ADJ.)	COOLING MODE
BETWEEN 50 DEG F AND 75 DEG F (ADJ.)	ECONOMIZER MODE
50 DEG F OR LESS (ADJ.)	HEATING MODE

6. IN THE OCCUPIED MODE OF FREEZESTAT (LOW LIMIT) MODE:
  - THE SUPPLY FAN AND EXHAUST SHALL BE OFF.
  - THE ENERGY RECOVERY WHEEL SHALL BE OFF.
  - THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL BE FULLY CLOSED.
  - FACE AND BYPASS DAMPER SHALL BE IN FULL FACE POSITION.
7. WHEN PLACED INTO THE OCCUPIED MODE, THE FOLLOWING SHALL OCCUR IN SEQUENTIAL ORDER AFTER OPERATION OF THE WATER-TO-WATER HEAT PUMP SYSTEM HAS BEEN PROVED:
  - THE ENERGY RECOVERY WHEEL SHALL START AND OPERATION SHALL BE PROVED VIA CURRENT SWITCH.
  - THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL FULLY OPEN AND BE PROVED VIA CURRENT SWITCH.
  - THE SUPPLY FAN/VFD AND EXHAUST FAN/VFD SHALL START AND OPERATION SHALL BE PROVED VIA CURRENT SWITCH.
  - THE SYSTEM SHALL NOT START IF ANY ONE COMPONENT DOES NOT PROVE OPERATION, INCLUDING THE HYDRONIC WATER-TO-WATER HEAT EXCHANGER SYSTEM.

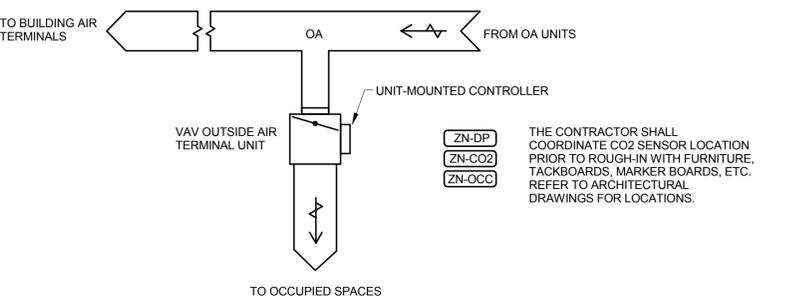
DISCHARGE AIR TEMPERATURE	MODE OF OPERATION
68 DEG F (ADJ.)	COOLING MODE
VARIES	ECONOMIZER MODE
65 DEG F (ADJ.)	HEATING MODE

(NOTE THAT THERE SHOULD BE NOT BE MORE THAN APPROXIMATELY 60% AIRFLOW NECESSARY ACROSS THE COOLING/HEATING COIL TO MAINTAIN REQUIRED DISCHARGE AIR TEMPERATURE. SET DAMPER ACTUATOR CONTROL ACCORDINGLY.)

9. IF THE OUTSIDE AIR TEMPERATURE IS BETWEEN 60 DEG F (ADJ.) AND 65 DEG F (ADJ.), THEN THE ENERGY RECOVERY WHEEL SHALL BE OFF. THE WATER-TO-WATER HEAT PUMP SYSTEM SHALL REMAIN OFF.
10. DEHUMIDIFICATION MODE: WHEN THE DUCT-MOUNTED EXHAUST AIR RELATIVE HUMIDITY SENSOR READS 65% OR GREATER, ENERGY RECOVERY WHEEL SHALL REMAIN ON AND BYPASS DAMPER SHALL CLOSE ALLOWING THE UNIT TO OPERATE WITH HALF AIRFLOW UNTIL EXHAUST AIR RELATIVE HUMIDITY IS BELOW 60%.
11. THE SUPPLY FAN SHALL BE CONTROLLED BY THE VFD BASED ON FIELD-MOUNTED DUCT PRESSURE SETPOINT. FAN SUPPLY STATIC PRESSURE OPTIMIZATION SHALL BE UTILIZED BY POLLING OF ASSOCIATED VAV/CAV BOX DAMPER POSITIONS AND RESETTING OF PRESSURE SETPOINT ALLOWED. DDC SYSTEM DETERMINES VAV BOX WITH GREATEST DAMPER OPEN POSITION ONCE EVERY TEN MINUTES. UNITS SUPPLY AIR STATIC PRESSURE SETPOINT DECREASED BY 0.1" WG AND 1.25" WG. SETPOINT IS 0.75" WG WHEN UNIT IS FIRST STARTED. DETERMINE IN THE FIELD WITH THE TAB CONTRACTOR THE STATIC PRESSURE SETPOINT TO OBTAIN ACCEPTABLE AIRFLOW AS DESIGNED.
12. HARDWARE INTERLOCK SUPPLY FAN, EXHAUST FAN, AND ISOLATION DAMPERS WITH EMERGENCY HVAC/VENTILATION KILL BUTTON.
13. THE EXHAUST FAN SHALL TRACK THE OUTSIDE AIR FAN V.A AIRFLOW STATION AND SHALL MAINTAIN A 1,000 CFM OFFSET FOR EACH UNIT TO MAINTAIN A POSITIVE BUILDING PRESSURIZATION. ALL RESTROOMS ARE PROVIDED WITH A CONSTANT VOLUME BOX AND SHALL MAINTAIN THE CFM INDICATED ON THE DRAWINGS. IF WHILE THE EXHAUST FAN TRACKS THE OUTSIDE AIR FAN THE CFM IN THE RESTROOM DROPS BELOW THIS AIRFLOW IN ANY ROOM BY 10%, THEN THE OUTSIDE AIR SHALL STOP DECREASING TO MAINTAIN APPROPRIATE TOILET EXHAUST AIR FLOW.
14. THE COIL IS A FULL FLOW COIL WITH FACE AND BYPASS DAMPER CONTROL FOR FREEZE PROTECTION AND DEHUMIDIFICATION CONTROL. LOW TEMPERATURE COIL IS ON THE DISCHARGE OF THE COIL AND SHALL ACTIVATE WHEN THE LEAVING AIR TEMPERATURE FALLS BELOW 35 DEG F. THE SUPPLY AND EXHAUST FAN/OUTSIDE AIR/FAN SHALL STOP DECREASING TO MAINTAIN APPROPRIATE TOILET EXHAUST AIR FLOW.
15. LOW TEMPERATURE SENSOR ERW FROST ALARM LOCATED ON THE DISCHARGE OF THE ENERGY RECOVERY WHEEL. WHEN THE LEAVING AIR TEMPERATURE FALLS BELOW 40 DEG F THE SUPPLY AND EXHAUST FANS SHALL STOP, OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE. WHEN TEMPERATURE RAISES TO 45 DEG F (ADJ.) SYSTEM SHALL RETURN TO NORMAL OPERATION.
16. A MANUAL RESET LOW LIMIT INSTALLED DOWNSTREAM OF THE CHILLED/HOT WATER COIL SHALL STOP THE OPERATION OF THE SYSTEM IF THE DISCHARGE TEMPERATURE FALLS BELOW 35 DEG F.
17. A SMOKE DETECTOR SHALL BE LOCATED IN EACH AIR SYSTEM. IF SMOKE IS DETECTED, THEN THE SYSTEM SHALL SHUT OFF AND AN AUDIOVISUAL ALARM SHALL ACTIVATE. UPON CORRECTION OF PROBLEM, THE SYSTEM SHALL BE RESET AND SHALL RETURN TO NORMAL OPERATION. COORDINATE WITH FIRE ALARM SYSTEM. ANY ACTIVATION OF BUILDING'S FIRE ALARM SYSTEM SHALL SHUT DOWN THE OA UNITS COMPLETELY.
18. THE UNIT SHALL BE PROVIDED WITH A BUILDING WARMUP/COOL DOWN BYPASS DUCT. THIS BYPASS SHALL BYPASS THE WHEEL AND CREATE A RECIRCULATING SYSTEM AND NOT USE ANY FRESH AIR SINCE THE BUILDING IS UNOCCUPIED. IF THE TEMPERATURE HAS FALLEN BELOW SETPOINT THE FANS SHALL BE ENGAGED AND THE UNIT SHALL DISCHARGE 88 DEG F (ADJ.). THE ASSOCIATED VAV BOX IN EACH ZONE SHALL OPEN USING THE OUTSIDE AIR UNIT TO BOOST TEMPERATURE. CONVERSELY, IF THE TEMPERATURE RAISES ABOVE OCCUPIED SETPOINT, THE UNIT SHALL CONTROL TO A 55 DEG F (ADJ.) DISCHARGE AIR TEMPERATURE TO REDUCE THE UNOCCUPIED TEMPERATURE. THE ASSOCIATED VAV BOX IN EACH ZONE SHALL OPEN. ALL CONSTANT VOLUME TOILET EXHAUST BOXES SHALL BE CLOSED DURING WARMUP/COOL DOWN CYCLE.

### OUTSIDE AIR VARIABLE VOLUME TERMINAL UNITS:

1. OUTSIDE AIR SPACES SHALL BE INTRODUCED DIRECTLY INTO SPACES OR DUCTED INTO HEAT PUMP RETURN AIR DUCTWORK.
2. EACH AIR TERMINAL LABELED "VAV" SHALL BE ALLOWED TO MODULATE FROM MINIMUM TO MAXIMUM OF CFM VALUE INDICATED ON THE PLANS BASED ON MEASURED INDOOR AND OUTDOOR CO2 LEVELS.
3. THIS CONTRACTOR SHALL PROVIDE AND INSTALL THE COMPLETE DEMAND CONTROL VENTILATION SYSTEM AS SPECIFIED.
4. THE VAV AIR TERMINAL SET POINT SHALL BE DETERMINED VIA INFORMATION PROVIDED FROM THE DEMAND CONTROL VENTILATION SYSTEM. THE DDC SYSTEM SHALL RECEIVE INDOOR AND OUTDOOR CO2 FROM THE DEMAND CONTROL VENTILATION SYSTEM. AS THE DIFFERENTIAL CO2 LEVEL INCREASES, THE ZONE VAV BOX SHALL INCREASE FROM MINIMUM TO MAINTAIN 700 PPM (ADJ.). WHERE MORE THAN ONE INDOOR CO2 VALUE IS AVAILABLE PER VAV BOX ZONE, THE DDC SYSTEM SHALL OPERATE TO MAINTAIN ALL ZONES WITH THE DIFFERENTIAL LEVEL SPECIFIED - THIS GENERALLY WILL OCCUR WHERE OUTSIDE AIR IS SUPPLIED TO HEAT PUMP RETURN AIR DUCTWORK.
5. AN ALARM SHALL BE GENERATED AT THE BAS WHEN THE ZONE CO2 DIFFERENTIAL VARIES BY 10% OR MORE FROM THE DESIGN VALUE.
6. EACH AIR TERMINAL LABELED "CAV" SHALL BE SET TO THE CFM VALUE INDICATED ON THE PLANS.
7. THE DEMAND CONTROL VENTILATION SYSTEM SHALL ALSO MEASURE SPACE DEWPOINT FROM EACH SENSOR LOCATION. USING THIS INFORMATION IN CONJUNCTION WITH THE SPACE TEMPERATURE THE DDC SYSTEM SHALL CALCULATE THE SPACE RELATIVE HUMIDITY (%RH).



### OUTSIDE AIR VARIABLE VOLUME TERMINAL UNITS

POINTS	DI	DO	AI	AO	CALCULATED
VAV BOX DAMPER POSITION				X	
VAV BOX AIRFLOW (CFM)			X		
OUTDOOR CO2 LEVEL (PPM)			X		
INDOOR CO2 LEVEL (PPM)			X		
OUTDOOR RH LEVEL (%)					X
INDOOR RH LEVEL (%)					X
ZONE OCCUPANCY	X				
OUTDOOR DEW POINT			X		
INDOOR ZONE DEW POINT			X		
SUM OF LEARNING STUDIOS CONNECTED TERMINAL UNITS (CFM)					X

POINTS	DI	DO	AI	AO	CALCULATED
SUPPLY FAN & VFD START, STOP, STATUS AND RUNTIME HOURS	X	X		X	X
EXHAUST FAN & VFD START, STOP, STATUS AND RUNTIME HOURS	X	X		X	X
SUPPLY AIR FAULT STATUS/ALARM	X				
EXHAUST AIR FAULT STATUS/ALARM	X				
ENERGY RECOVERY WHEEL START, STOP, STATUS AND RUNTIME HOURS	X	X			X
OUTSIDE AIR HUMIDITY UPSTREAM OF ENERGY RECOVERY WHEEL (F) - THROUGH FMS			X		
UNIT OUTSIDE AIR DAMPER COMMAND AND STATUS	X	X			
UNIT EXHAUST AIR DAMPER COMMAND AND STATUS	X	X			
TOILET EXHAUST AIR DAMPER				X	
GENERAL EXHAUST AIR DAMPER				X	
FACE AND BYPASS DAMPER				X	
WARMUP BYPASS DAMPER				X	
SMOKE DETECTOR (TYP. 2)	X				
LOW LIMIT (FREEZE-STAT)	X				
OUTSIDE AIR TEMPERATURE UPSTREAM OF ENERGY RECOVERY WHEEL (F)			X		
OUTSIDE AIR TEMPERATURE DOWNSTREAM OF ENERGY RECOVERY WHEEL (F)			X		
EXHAUST HUMIDITY UPSTREAM OF ENERGY RECOVERY WHEEL (F)			X		
EXHAUST AIR TEMPERATURE UPSTREAM OF ENERGY RECOVERY WHEEL (F)			X		
EXHAUST AIR TEMPERATURE DOWNSTREAM OF ENERGY RECOVERY WHEEL (F)			X		
2-PIPE COIL LEAVING AIR TEMPERATURE (F)			X		
UNIT LEAVING AIR TEMPERATURE (F)			X		
SUPPLY DUCT STATIC PRESSURE ("w.g.)			X		
TOILET EXHAUST DIFFERENTIAL PRESSURE ("w.g.)			X		
SUM OF CONNECTED TERMINAL UNITS (CFM)					X
ENERGY RECOVERY WHEEL DIFFERENTIAL PRESSURE SENSOR			X		

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

BDH LMM KDM

PM/DM

BRANCH MANAGER

CHIEF ENR ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
DODEA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

REPLACE QUANTICO M/H SCHOOL

TEMPERATURE CONTROLS SCHEMATICS

SCALE: 12" = 1'-0"

PROJECT NO.: P-021

CONSTR. CONTR. NO. W91236-15-C-0023

NAVFAC DRAWING NO. 13091275

SHEET 521 OF 789

M805

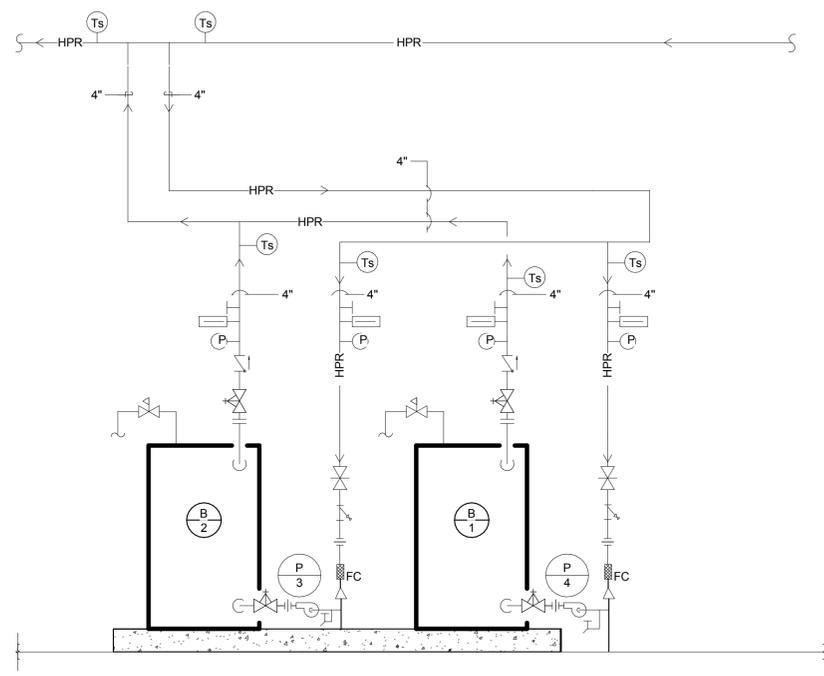
DRAWING REVISION: 10 MARCH 2020

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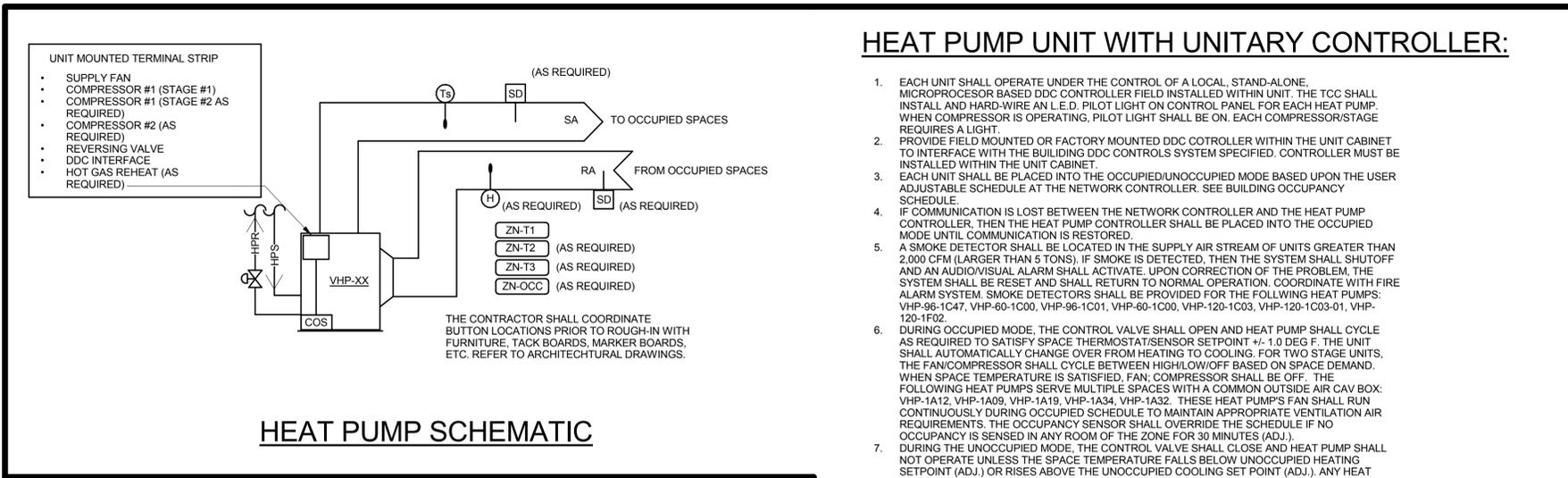
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**BOILER PIPING SCHEMATIC**  
NTS

**BOILER SYSTEM:**

- THE HEAT PUMP WATER LOOP SYSTEM CONTROLLER SHALL ENABLE THE BOILER AND ITS ASSOCIATED PUMP WHEN THE HEAT PUMP WATER LOOP IS LESS THAN OR EQUAL TO 50 DEGREES. CONTROL VALVES AT HX-1 SHALL BE POSITIONED TO BYPASS HEAT EXCHANGER UNTIL LOOP REQUIRES COOLING.
- PROVIDE LEAD/LAG CONTROL FOR BOILERS AND ASSOCIATED PUMP.
- THE BOILER PUMP P-3/P-4 SHALL START AND CONFIRM FLOW PRIOR TO BOILER FIRING. THE PUMP SHALL RUN FOR ONE (1) MINUTE AFTER BOILER STOPS FIRING.
- WHEN IN HEATING MODE THE BOILERS SHALL STAGE AND OPERATE UNDER THEIR OWN CONTROLS. THE BOILERS SHALL OPERATE AS REQUIRED TO MAINTAIN A MINIMUM HEADER TEMPERATURE (HPR MAIN LOOP) OF 60 DEG. F (ADJ.) PUMP P-3 AND P-4 SHALL BE INTERLOCKED TO BOILER OPERATION AND PROVIDE CONSTANT VOLUME FLOW OF 90 GPM. THE BOILERS SHALL VARY FIRE UNDER THEIR OWN CONTROLS TO MAINTAIN HEADER TEMPERATURE. UPON BOILER MINIMUM FIRE ACHIEVING A 70 DEGREE HPR MAIN LOOP HEADER TEMPERATURE BOILERS SHALL CEASE OPERATION.
- ALL BOILER ALARMS SHALL BE PROVIDED TO BUILDING MANAGEMENT SYSTEM.
- THE CONTRACTOR SHALL PROVIDE A BOILER AND WATER HEATER EMERGENCY SHUTOFF BUTTON INTEGRATED WITHIN THE LOC STATION LOCATED AT EACH MECHANICAL ROOM EXIT (2 LOCATIONS) IN ACCORDANCE WITH THE PROVISIONS OF THE ASME BOILER AND PRESSURE VESSEL CODE, SECTION IV, ARTICLE HG-634.
- PUMPS P-1 AND P-2 SHALL INCLUDE A VFD. THE PUMPS SHALL OPERATE IN LEAD/LAG CONTROL. DURING OCCUPIED MODE, THE PUMPS SHALL BE ON AND MODULATE SPEED TO MAINTAIN A PRESSURE SETPOINT. LOCATE THE PRESSURE SENSOR IN THE PIPING AS SHOWN ON THE PLANS. OPTIMIZE PRESSURE SETPOINT WITH ASSISTANCE FROM THE TEST AND BALANCE CONTRACTOR.



**HEAT PUMP SCHEMATIC**

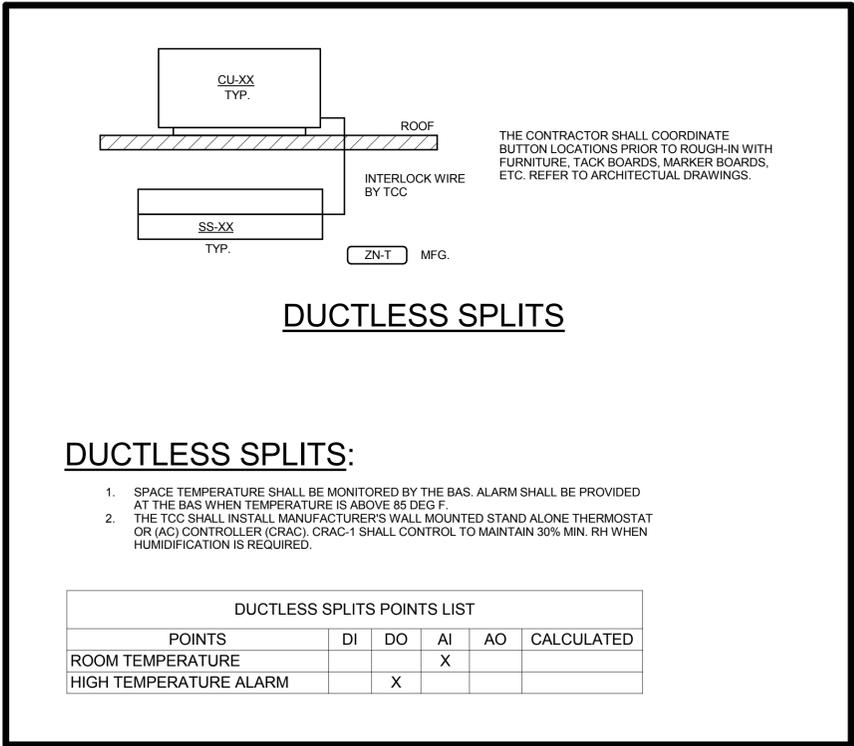
**HEAT PUMP UNIT WITH UNITARY CONTROLLER:**

- EACH UNIT SHALL OPERATE UNDER THE CONTROL OF A LOCAL, STAND-ALONE MICROPROCESSOR BASED DDC CONTROLLER FIELD INSTALLED WITHIN UNIT. THE TCC SHALL INSTALL AND HARD-WIRE AN E.D. PILOT LIGHT ON CONTROL PANEL FOR EACH HEAT PUMP. WHEN COMPRESSOR IS OPERATING, PILOT LIGHT SHALL BE ON. EACH COMPRESSOR/STAGE REQUIRES A LIGHT.
- PROVIDE FIELD MOUNTED OR FACTORY MOUNTED DDC CONTROLLER WITHIN THE UNIT CABINET TO INTERFACE WITH THE BUILDING DDC CONTROLS SYSTEM SPECIFIED. CONTROLLER MUST BE INSTALLED WITHIN THE UNIT CABINET.
- EACH UNIT SHALL BE PLACED INTO THE OCCUPIED/UNOCCUPIED MODE BASED UPON THE USER ADJUSTABLE SCHEDULE AT THE NETWORK CONTROLLER. SEE BUILDING OCCUPANCY SCHEDULE.
- IF COMMUNICATION IS LOST BETWEEN THE NETWORK CONTROLLER AND THE HEAT PUMP CONTROLLER, THEN THE HEAT PUMP CONTROLLER SHALL BE PLACED INTO THE OCCUPIED MODE UNTIL COMMUNICATION IS RESTORED.
- A SMOKE DETECTOR SHALL BE LOCATED IN THE SUPPLY AIR STREAM OF UNITS GREATER THAN 2,000 CFM (LARGER THAN 5 TONS). IF SMOKE IS DETECTED, THEN THE SYSTEM SHALL SHUT OFF AND AN AUDIO/VISUAL ALARM SHALL ACTIVATE. UPON CORRECTION OF THE PROBLEM, THE SYSTEM SHALL BE RESET AND SHALL RETURN TO NORMAL OPERATION. COORDINATE WITH FIRE ALARM SYSTEM. SMOKE DETECTORS SHALL BE PROVIDED FOR THE FOLLOWING HEAT PUMPS: VHP-96-1047, VHP-60-1000, VHP-96-1001, VHP-60-1000, VHP-120-1003, VHP-120-1003-01, VHP-120-1F02.
- DURING OCCUPIED MODE, THE CONTROL VALVE SHALL OPEN AND HEAT PUMP SHALL CYCLE AS REQUIRED TO SATISFY SPACE THERMOSTAT/SENSOR SETPOINT +/- 1.0 DEG F. THE UNIT SHALL AUTOMATICALLY CHANGE OVER FROM HEATING TO COOLING. FOR TWO STAGE UNITS, THE FAN/COMPRESSOR SHALL CYCLE BETWEEN HIGH/LOW/OFF BASED ON SPACE DEMAND. WHEN SPACE TEMPERATURE IS SATISFIED, FAN/COMPRESSOR SHALL BE OFF. THE FOLLOWING HEAT PUMPS SERVE MULTIPLE SPACES WITH A COMMON OUTSIDE AIR CAV BOX: VHP-1A12, VHP-1A09, VHP-1A19, VHP-1A34, VHP-1A32. THESE HEAT PUMPS FAN SHALL RUN CONTINUOUSLY DURING OCCUPIED SCHEDULE TO MAINTAIN APPROPRIATE VENTILATION AIR REQUIREMENTS. THE OCCUPANCY SENSOR SHALL OVERRIDE THE SCHEDULE IF NO OCCUPANCY IS SENSED IN ANY ROOM OF THE ZONE FOR 30 MINUTES (ADJ.).
- DURING THE UNOCCUPIED MODE, THE CONTROL VALVE SHALL CLOSE AND HEAT PUMP SHALL NOT OPERATE UNLESS THE SPACE TEMPERATURE FALLS BELOW UNOCCUPIED HEATING SETPOINT (ADJ.) OR RISES ABOVE THE UNOCCUPIED COOLING SET POINT (ADJ.). ANY HEAT PUMP THAT IS CONNECTED TO MORE THAN ONE THERMOSTAT SHALL OPERATE WITH AVERAGING SENSORS. THE SPACE TEMPERATURE SETPOINT SHALL BE ADJUSTABLE ONLY AT THE NETWORK CONTROLLER. THE AVERAGE SPACE TEMPERATURE OF THE SENSORS WILL DETERMINE THE SPACE TEMPERATURE USED TO DETERMINE OPERATION OF THE UNIT.
- LARGE HEAT PUMP UNITS EACH HAVE MULTIPLE COMPRESSORS FOR STAGES OF CONTROL. COMPRESSORS AND UNITS SHALL STAGE ON/OFF AS REQUIRED TO SATISFY SETPOINT. COMPRESSORS/UNITS SHALL ALSO LEAD/LAG ON A WEEKLY (ADJ.) BASIS.
- PROVIDE A PUSHBUTTON OVERRIDE ON ALL SENSORS. IF THE NETWORK CONTROLLER IS IN THE UNOCCUPIED MODE WHEN A PUSHBUTTON OVERRIDE BUTTON IS ACTIVATED, THEN THE ACTIVATED HEAT PUMP SHALL BE PLACED INTO OCCUPIED MODE. THIS DOES NOT INCLUDE THE OUTSIDE AIR SYSTEMS. WHEN THE PUSHBUTTON OVERRIDE IS ACTIVATED THEN THE HEAT PUMP SHALL BE PLACED INTO OPERATION FOR 1 HOUR (ADJ.).
- THE CONDENSATE OVERFLOW SWITCHES SHALL BE PROVIDED AND INTERANALLY WIRED BY EQUIPMENT MANUFACTURER FROM THE FACTORY.
- GYM AREA IS SERVED BY TWO HEAT PUMPS. UNITS SHALL OPERATE LEAD-LAG. THE UNITS SHALL BE STAGES AS FOLLOWS:

COOLING/HEATING STAGE 1	HEAT PUMP NUMBER VHP-120-1003 1ST COMPRESSOR
STAGE 2	VHP-120-1003 2ND COMPRESSOR
STAGE 3	VHP-120-1003-01 1ST COMPRESSOR
STAGE 4	VHP-120-1003-01 2ND COMPRESSOR

**HEAT PUMP AND TERMINAL UNIT OCCUPANCY SENSOR CONTROL:**

- SPACE OCCUPANCY SENSORS ARE INSTALLED BY ELECTRICAL CONTRACTOR AND ARE DUAL OUTPUT FOR LIGHTING AND HVAC. WIRING SHALL BE INSTALLED BY THE TCC FROM THE SENSOR TO A DDC CONTROLLER PROVIDED BY THE TCC.
- WHEN BUILDING IS IN OCCUPIED MODE AND THE SPACE IS OCCUPIED BASED ON ROOM OCCUPANCY SENSOR, THE HEAT PUMP SHALL CONTROL TO MAINTAIN SPACE TEMPERATURE SETPOINT.
- WHEN BUILDING IS IN OCCUPIED MODE AND THE SPACE IS UNOCCUPIED BASED ON ROOM OCCUPANCY SENSOR, THE ASSOCIATED HEAT PUMP SHALL BE OFF AND RESET SPACE TEMPERATURE SETPOINT TO TEMPORARY UNOCCUPIED MODE. WHERE ONE UNIT CONTROLS MORE THAN ONE ROOM, ALL SPACES OCCUPANCY SENSORS MUST SENSE NO OCCUPANCY.
- OCCUPANCY SENSOR UNOCCUPIED MODE SETPOINT SHALL BE 3 DEG F (ADJ.) ABOVE OCCUPIED COOLING AND 3 DEG (ADJ.) BELOW OCCUPIED HEATING TEMPERATURE SETPOINT. AFTER THE SPACE IS UNOCCUPIED FOR 2 HOURS THE SETPOINT SHALL AUTOMATICALLY RESET TO THE UNOCCUPIED HEATING AND COOLING SETPOINTS STATED IN THE HEAT PUMP SEQUENCES.
- IF THE SPACE REACHES OCCUPANCY SENSOR UNOCCUPIED MODE SETPOINT WITHIN THE 2 HOURS, THE HEAT PUMP SHALL RETURN TO REGULAR OCCUPIED MODE UNTIL SPACE TEMPERATURE IS SATISFIED AND THEN RETURN TO TEMPORARY UNOCCUPIED MODE IF ROOM REMAINS UNOCCUPIED.
- THE MAJORITY OF HEAT PUMPS OPERATE WITH MORE THAN ONE OCCUPANCY SENSOR. IF ONE SPACE IS UNOCCUPIED BASED ON ROOM OCCUPANCY SENSOR, THE ASSOCIATED HEAT PUMP SHALL IGNORE THE SPACE TEMPERATURE SENSOR IN THE AVERAGE SPACE TEMPERATURE CALCULATION USED TO DETERMINE OPERATION OF THE UNIT.
- ANY TIME A HEAT PUMP IS REQUIRED TO BE ENGAGED IN UNOCCUPIED MODE EITHER BY ELEVATED/LOWERED SPACE TEMPERATURE OR FROM AN OVERRIDE BUTTON, THE HEAT PUMP LOOP PUMPING SYSTEM MUST BE ENABLED AND OPERATE UNDER ITS CONTROL SEQUENCE.



**DUCTLESS SPLITS**

**DUCTLESS SPLITS:**

- SPACE TEMPERATURE SHALL BE MONITORED BY THE BAS. ALARM SHALL BE PROVIDED AT THE BAS WHEN TEMPERATURE IS ABOVE 85 DEG F.
- THE TCC SHALL INSTALL MANUFACTURER'S WALL MOUNTED STAND ALONE THERMOSTAT OR (AC) CONTROLLER (CRAC). CRAC-1 SHALL CONTROL TO MAINTAIN 30% MIN. RH WHEN HUMIDIFICATION IS REQUIRED.

**DUCTLESS SPLITS POINTS LIST**

POINTS	DI	DO	AI	AO	CALCULATED
ROOM TEMPERATURE			X		
HIGH TEMPERATURE ALARM		X			

**BOILER SYSTEM POINTS LIST**

POINTS	DI	DO	AI	AO	CALCULATED
BOILER ALARMS (ALL MANUFACTURER PROVIDED ALARMS)				X	
BOILER B-1 RETURN TEMPERATURE	X				
BOILER B-1 SUPPLY TEMPERATURE	X				
BOILER B-2 RETURN TEMPERATURE	X				
BOILER B-2 SUPPLY TEMPERATURE	X				
BOILER LOW WATER ALARM	X				
HPR HEADER TEMPERATURE DOWNSTREAM BOILERS	X				
HPR HEADER TEMPERATURE UPSTREAM OF BOILERS	X				
HPR PRESSURE (PSI) (x4 TOTAL SENSORS)	X				
P-1, P-2 PUMP SPEED, OVERRIDE SPEED	X	X			
P-1, P-2 START, STOP, STATUS, AND RUNTIME HOURS			X	X	X
P-3, P-4 PUMP SPEED, OVERRIDE SPEED	X	X			
P-3, P-4 START, STOP, STATUS, AND RUNTIME HOURS			X	X	X

**HEAT PUMP POINTS LIST**

POINTS	DI	DO	AI	AO	CALCULATED
SUPPLY FAN(S) START, STOP, STATUS AND RUNTIME HOURS	X	X			X
COMPRESSOR(S) START, STOP, STATUS AND RUNTIME HOURS	X	X			X
SUPPLY AIR TEMPERATURE			X		
SPACE TEMPERATURE(S) (REFER TO ZONE SCHEDULE)			X		
SMOKE DETECTORS (WHERE CODE REQUIRED)	X				
OCCUPIED SENSOR STATUS (REFER TO ZONE SCHEDULE)	X				
GENERAL ALARM		X			
SPACE DEWPOINT (THROUGH FMS)			X		
CONTROL VALVE STATUS POSITION				X	

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

BOH LMM KDM

PM/DM

BRANCH MANAGER

CHIEF ENG/ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
D/DEA

MARINE CORPS BASE QUANTICO  
QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated  
PROJECT NO.: P-021  
CONSTR CONTR NO.: W91236-15-C-0023  
NAVFAC DRAWING NO.: 13091276  
SHEET 522 OF 789  
M806

DATE

SYN DESCRIPTION

SEAL

STATE OF KENTUCKY  
KEVIN J. MUSSEY  
22266  
PROFESSIONAL ENGINEER

EWING COLE  
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100 North 6th Street  
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Tel: 215-923-2020 Fax: 215-574-0892

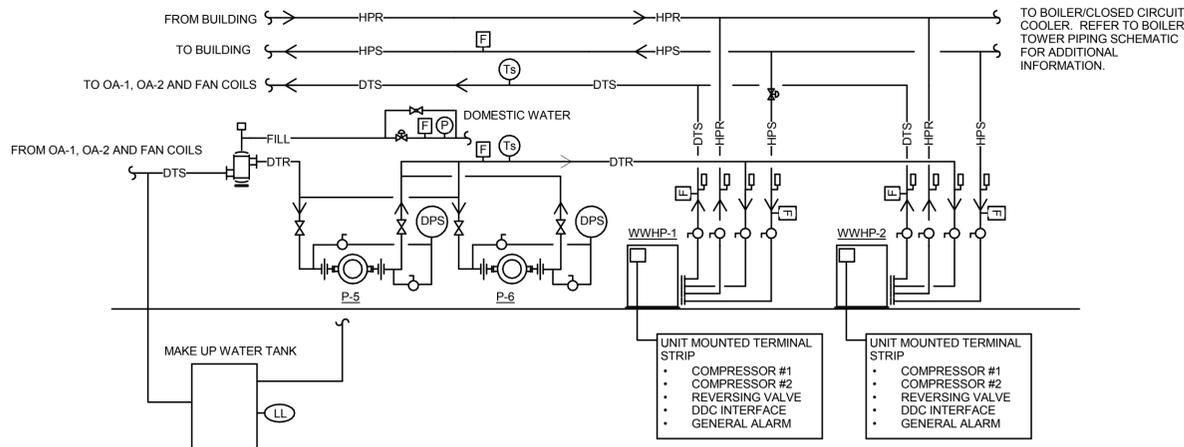
AE INFO

### MAKE-UP WATER ALARM AND SHUTDOWN:

- ON THE MAKE-UP WATER LINE, A LINE SIZED TWO-WAY, TWO-POSITION NORMALLY OPEN VALVE SHALL CLOSE IF (AFTER A TIME DELAY OF TWO MINUTES) THE MAKE-UP WATER CONTINUES FLOWING AT A RATE OF 3 GALLONS PER MINUTE OR IF THE PRESSURE DROPS BELOW 12 PSI (ADJ.) WHILE THE SYSTEM SWITCH IS IN THE NORMAL OPERATING POSITION. AN ALARM SHALL BE SENT TO THE BAS. AN AUDIBLE ALARM MOUNTED ON THE CONTROL PANEL (MOUNTED VERY NEAR THE MAKE-UP NETWORK) SHALL SOUND AND AN INDICATOR LIGHT WILL PROVIDE VISUAL INDICATION OF A PROBLEM. A MOMENTARY PUSH BUTTON ON THE PANEL SHALL BE USED TO SILENCE/ACKNOWLEDGE THE ALARM AND RESET SYSTEM FOR NORMAL OPERATION AFTER ANY NECESSARY REPAIRS ARE MADE. A SWITCH MOUNTED ON THE PANEL SHALL BE USED TO SHUT DOWN THE ALARM WHILE NORMAL SYSTEM FILL OPERATIONS ARE PERFORMED. THIS SWITCH AND ALL PANEL MOUNTED DEVICES ARE TO BE APPROPRIATELY LABELED. PROVIDE AND COORDINATE INSTALLATION BY MECHANICAL CONTRACTOR THE VALVE AND ONICON MODEL F-1310 INLINE TURBINE FLOW METER. FLOW METER TO BE LINE SIZED WITH UNION BODY, SCALED 0-10 GPM RANGE IS 0-10 VOLT OUTPUT.

MAKE-UP WATER ALARM AND SHUTDOWN POINTS LIST

POINT	DI	DO	AI	AO	CALCULATED
HPS/HPR MAKE-UP WATER FLOW RATE (GPM)			X		
HPS/HPR PRESSURE (PSI)			X		
HPS/HPR VALVE	X	X			
HPS/HPR MAKE-UP WATER ALARM AND SILENCE	X	X			



### WATER TO WATER UNIT SYSTEM PIPING SCHEMATIC

NOT TO SCALE

WATER TO WATER UNIT SYSTEM POINTS LIST

POINTS	DI	DO	AI	AO	CALCULATED
P-5,P-6 START, STOP, STATUS AND RUNTIME HOURS	X	X			X
WWHP-1, WWHP-2 COMPRESSORS START, STOP, STATUS AND RUNTIME HOURS (4 TOTAL)	X	X			X
COMMON SUPPLY WATER TEMPERATURE (F)			X		
COMMON RETURN WATER TEMPERATURE (F)			X		
WWHP-1, WWHP-2 SUPPLY WATER TEMPERATURE (2 TOTAL)			X		
MAKEUP WATER FLOW RATE (GPM)			X		
VALVE STATUS AND POSITION		X		X	
WWHP-1, WWHP-2 GENERAL ALARM	X				

### WATER -TO-WATER HEAT PUMP SYSTEM:

- THE SYSTEM SHALL OPERATE UNDER THE CONTROL OF A LOCAL, STAND-ALONE, MICROPROCESSOR BASED BAS CONTROLLER FIELD INSTALLED ADJACENT TO UNITS. IF COMMUNICATION IS LOST BETWEEN THE BAS AND THE CONTROLLER, THEN THE CONTROLLER SHALL BE PLACED INTO THE OCCUPIED MODE UNTIL COMMUNICATION IS RESTORED.
- IN THE UNOCCUPIED MODE OR ECONOMIZER MODE (OA TEMPERATURE BETWEEN 60 DEG. F AND 65 DEG. F):
  - WWHP-1 AND WWHP-2
  - WWHP 2-WAY 2-POSITION CONTROL VALVE SHALL BE CLOSED.
  - CHILLED/HOT WATER PUMPS P-5 AND P-6 SHALL BE OFF.
- WHEN PLACED INTO THE OCCUPIED MODE, THE FOLLOWING SHALL OCCUR IN SEQUENTIAL ORDER PRIOR TO STARTING AIR HANDLING SYSTEM.
  - THE HEAT PUMP DISTRIBUTION PUMPS P-1 AND P-2 SHALL BE ACTIVATED WHENEVER THIS SYSTEM IS IN OPERATION.
  - WWHP 2-WAY VALVE SHALL OPEN.
  - CHILLED/HOT WATER PUMP P-5 OR P-6 AND ASSOCIATED VFD SHALL START AND OPERATION SHALL BE PROVEN VIA DIFFERENTIAL PRESSURE SWITCH.
  - WWHP-1 AND WWHP-2 SHALL START AS REQUIRED AND OPERATION SHALL BE PROVED VIA LEAVING WATER TEMPERATURE.
  - THE SYSTEM SHALL NOT START IF ANY ONE COMPONENT DOES NOT PROVE OPERATION.
- THE PUMP SHALL OPERATE CONTINUOUSLY DURING OCCUPIED PERIODS WHEN IN COOLING MODE OR HEATING MODE OR WHEN THE OUTSIDE TEMPERATURE IS BELOW 35 DEG F (ADJ.).
- IF NO WATER FLOW IS SENSED BY FLOW METER, THEN AN ALARM SIGNAL SHALL BE GENERATED. A 30 SECOND TIME DELAY SHALL BE PROVIDED TO PREVENT FALSE ALARMS.
- COOLING MODE OPERATION:
 

RETURN WATER TEMP	WWHP-1 COMP #1/#2	WWHP-2 COMP #1/#2
BELOW 45.0F	OFF/OFF	OFF/OFF
45.0F - 48.5F	ON/OFF	OFF/OFF
48.5F - 52.0F	ON/OFF	ON/OFF
52.0F - 55.0F	ON/ON	ON/OFF
55.0F OR GREATER	ON/ON	ON/ON
- ECONOMIZER MODE:
  - WWHP-1, WWHP-2 SHALL BE OFF.
  - P-5, P-6 SHALL BE OFF.
- HEATING MODE OPERATION:
 

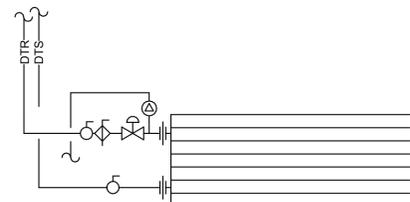
RETURN WATER TEMP	WWHP-1 COMP #1/#2	WWHP-2 COMP #1/#2
ABOVE 110.0F	OFF/OFF	OFF/OFF
110.0F - 107.2F	ON/OFF	OFF/OFF
107.3F - 104.8F	ON/OFF	ON/OFF
104.4F - 101.7F	ON/ON	ON/OFF
101.6F OR LESS	ON/ON	ON/ON
- IF AFTER 15 MINUTES (ADJ.), THE SUPPLY SETPOINT IS STILL MORE THAN 2 DEG F (ADJ.) FROM SETPOINT, THEN ANOTHER HEAT PUMP/CHILLER/BOILER SHALL OPERATE 100% TO ASSIST IN REACHING SUPPLY TEMPERATURE, ETC. ONCE SETPOINT IS REACHED, THE HEAT PUMP CHILLER/BOILERS SHALL STAGE ON/OFF AS SPECIFIED.
- IF ANY ONE COMPONENT OF THE LEAD SYSTEM DOES NOT PROVE OPERATION, THEN THE LAG SYSTEMS SHALL ACTIVATE ACCORDING TO THE SAME SEQUENCE AND AN ALARM SHALL BE GENERATED.
- THERE SHALL BE A 5 MINUTE ADJUSTABLE TIME DELAY BEFORE AN ADDITIONAL COMPRESSOR CAN BE STAGED ON OR OFF.
- ADDITIONALLY, THE WATER-TO-WATER HEAT EXCHANGERS SHALL HAVE THE ABILITY TO SEQUENCE THE START ORDER EITHER WWHP-1 AND WWHP- 2 STARTING FIRST.
- BTU METER SHALL BE BACNET MS/TP COMPATIBLE. UNIT SHALL HAVE DIFFERENTIAL TEMPERATURE ACCURACY +/- 15 DEG F OVER THE CALIBRATION RANGE WITH COMPUTING NONLINEARLY WITHIN +/- 0.05%. MEMORY SHALL BE NON-VOLATILE EEPROM TO RETAIN ALL PARAMETERS AND TOTALIZED VALUES IN THE EVENT OF A POWER LOSS. PROVIDE BTU METER WITH LCD DISPLAY FOR TOTAL ENERGY, FLOW RATE, SUPPLY AND RETURN TEMPERATURES. PROVIDE N.I.S.T. TRACEABLE CALIBRATION CERTIFICATION.

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C

B

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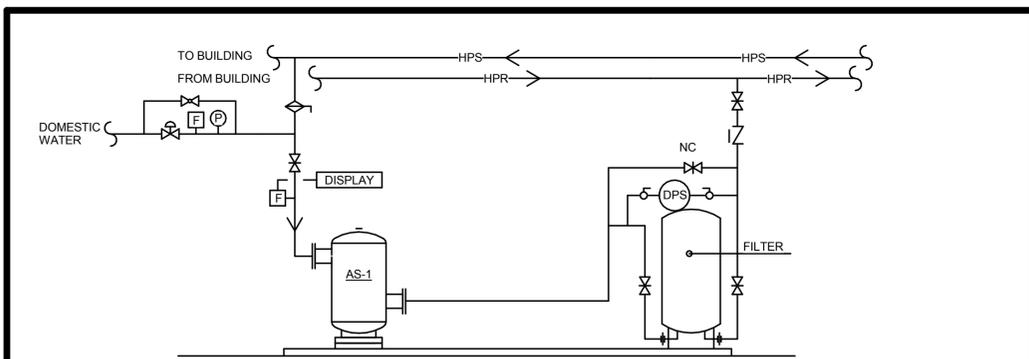
FAN COIL UNIT  
NOT TO SCALE

### FAN COIL UNIT:

- SPACE TEMPERATURE SHALL BE MONITORED BY THE BAS. ALARM SHALL BE PROVIDED AT THE BAS WHEN TEMPERATURE IS ABOVE 85 DEG. F (ADJ.) AND BELOW 55 DEG. F (ADJ.).
- THE TCC SHALL INSTALL MANUFACTURER'S WALL MOUNTED THERMOSTAT.
- IN OCCUPIED MODE, THE FOLLOWING SHALL OCCUR: CONTROL VALVE SHALL OPEN, FAN SHALL START. FAN AND CONTROL VALVE SHALL MODULATE AS REQUIRED TO SATISFY ROOM TEMPERATURE SETPOINT +/- 2 DEG. F. FAN SHALL OPERATE AT MEDIUM SETPOINT. VESTIBULE ROOM TEMPERATURE SHALL BE SET AT 85 DEG. F (ADJ.) IN THE SUMMER AND 55 DEG. F (ADJ.) IN THE WINTER. ALL OTHER ROOM TEMPERATURES SHALL BE SET AT 75 DEG. F (ADJ.) IN THE SUMMER AND 65 DEG. F (ADJ.) IN THE WINTER. IF THERMOSTAT CALLS FOR COOLING AND THE WATER-TO-WATER HEAT PUMP SYSTEM IS IN HEATING MODE OPERATION, THE CONTROL VALVE SHALL CLOSE AND FAN SHALL BE OFF. IF THERMOSTAT CALLS FOR HEATING AND THE WATER-TO-WATER HEAT PUMP SYSTEM IS IN COOLING MODE OPERATION, THE CONTROL VALVE SHALL CLOSE AND FAN SHALL BE OFF.
- IN UNOCCUPIED MODE, THE CONTROL VALVE SHALL CLOSE AND FAN SHALL BE OFF UNLESS THE ROOM TEMPERATURE FALLS BELOW THE UNOCCUPIED HEATING SETPOINT (ADJ.) OR RISES ABOVE THE UNOCCUPIED COOLING SETPOINT (ADJ.).

FAN COIL POINTS LIST

POINTS	DI	DO	AI	AO	CALCULATED
CONTROL VALVE STATUS POSITION				X	
FAN START, STOP, AND STATUS	X	X			
HIGH TEMPERATURE ALARM		X			
LOW TEMPERATURE ALARM		X			
ROOM TEMPERATURE			X		
ROOM TEMPERATURE SETPOINT			X		



### HEAT PUMP FILTRATION PIPING SCHEMATIC

### BYPASS FILTRATION UNIT:

- THE BAS SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER AND ALARM FOR DIRTY FILTER AT THE FILTER MANUFACTURERS RECOMMENDED SETPOINT.

HEAT PUMP FILTRATION PIPING POINTS LIST

POINTS	DI	DO	AI	AO	CALCULATED
HPS/HPR FLOW RATE (GPM)			X		
HPS/HPR DIRTY FILTER ALARM	X				
DTS/DTR FLOW RATE (GPM)			X		
DTS/DTR DIRTY FILTER ALARM	X				

### KITCHEN MAKE-UP AIR/EXHAUST FANS:

- THE KITCHEN EXHAUST SYSTEM IS A VARIABLE FLOW SYSTEM THAT SHALL OPERATE UNDER ITS OWN CONTROLS AND SHALL MODULATE THE EXHAUST FAN VFD ACCORDINGLY. TEMPERATURE SENSORS SHALL BE PROVIDED WITH THE SYSTEM AND INSTALLED BY CONTROLS CONTRACTOR EVERY 24" ACCORDING TO MANUFACTURER REQUIREMENTS. THE VFD THAT CONTROLS THE EXHAUST FAN SHALL BE PROVIDED WITH THE SYSTEM. AS THE EXHAUST FAN RAMP UP AND DOWN IN ACCORDANCE WITH THE TEMPERATURE, THE MAKE-UP AIR FAN SHALL BE INTERCONNECTED AND SHALL RAMP UP AND DOWN SIMULTANEOUSLY TO MAINTAIN APPROPRIATE PRESSURIZATION.
- THE MODULATING GAS VALVE FOR THE MAKE-UP AIR UNIT SHALL BE PROVIDED BY CONTROLS CONTRACTOR. THE GAS VALVE SHALL MODULATE TO MAINTAIN A 65 DEG F (ADJ.) DISCHARGE AIR TEMPERATURE.
- THE MAKE-UP AIR UNIT SHALL HAVE AN ISOLATION OUTSIDE AIR DAMPER INTERCONNECTED TO THE VENTILATION KILL SWITCH. ANYTIME THE MAKE-UP AIR UNIT IS RUNNING THE DAMPER SHALL BE OPEN. AN END SWITCH SHALL BE PROVIDED AND PROVEN PRIOR TO STARTING THE FAN. UPON ACTIVATION OF THE EMERGENCY KILL SWITCH FROM ANY "LOC" LOCATION, THE DAMPER SHALL BE SHUT AND THE FAN SHALL BE DE-ACTIVATED.
- THE MAKE-UP AIR UNIT SHALL BE INTERCONNECTED TO THE FIRE ALARM SYSTEM PROVIDED AT THE HOOD. UPON ACTIVATION, THE MAKE-UP AIR SHALL BE DE-ACTIVATED, DAMPER CLOSED AND EXHAUST FAN SHALL REMAIN IN OPERATION. UPON FIRE ALARM ACTIVATION, THE KITCHEN EQUIPMENT GAS VALVE AND MAKE-UP AIR UNIT GAS VALVE SHALL CLOSE.
- THE VARIABLE FLOW SYSTEM SHALL BE PROVIDED WITH A CONTROLLER THAT ACTIVATES HOOD EXHAUST AND LIGHTS UNDER THE HOOD.

KITCHEN MAKE-UP AIR/EXHAUST SYSTEM POINTS LIST

POINTS	DI	DO	AI	AO	CALCULATED
MAKEUP AIR UNIT FAN START, STOP, STATUS, AND RUNTIME HOURS	X	X		X	X
UNIT LEAVING AIR TEMPERATURE			X		
MAKEUP AIR UNIT ISOLATION DAMPER COMMAND AND STATUS	X	X			
KITCHEN DCVF ENABLE/DISABLE		X			
KITCHEN EQUIPMENT GAS VALVE				X	
DCVF 4-20 MA SIGNAL TO EF-5				X	

APPR. DATE

SYN. DESCRIPTION

**EWING COLE**  
 Federal Reserve Bank Building  
 100 North 6th Street  
 Philadelphia, PA 19106-1500  
 Tel: 215-923-2020 Fax: 215-574-0852

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

BOH LMM KDM

PM/DM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
 NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON DODEA  
 MARINE CORPS BASE QUANTICO, VIRGINIA  
 QUANTICO, VA

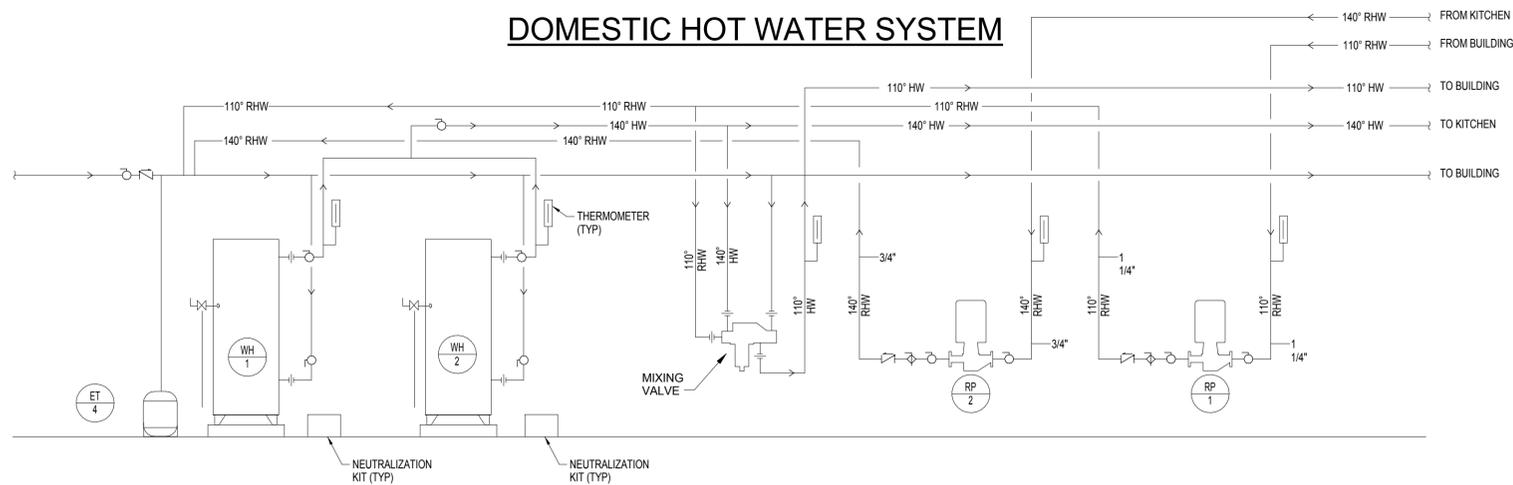
**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated  
 PROJECT NO: P-021  
 CONSTR. CONTR. NO. W91236-15-C-0023  
 NAVFAC DRAWING NO. 13091277  
 SHEET 523 OF 789  
 M807

DRAWING REVISION 10 MARCH 2016

### DOMESTIC HOT WATER SYSTEM



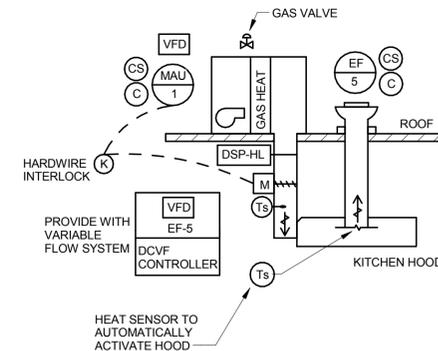
#### 1. DOMESTIC HOT WATER HEATERS AND RECIRCULATING PUMPS

- 1.1 THE DOMESTIC HOT WATER SYSTEM SHALL BE ENABLED WHEN BUILDING IS SCHEDULED TO BE OCCUPIED. OCCUPIED OPERATION HOURS SHALL BE MONDAY THRU FRIDAY 6AM TO 5PM (ADJ.).
- 1.2 WHEN THE DOMESTIC HOT WATER SYSTEM IS ENABLED, WATER HEATERS, WH-1 AND WH-2, SHALL MAINTAIN A LEAVING WATER TEMPERATURE OF 140 DEG. F (ADJ.) OPERATING UNDER ITS OWN CONTROLS.
- 1.3 110 DEG. RECIRCULATING PUMP RP-1 SHALL ENERGIZE IF WATER TEMPERATURE IN RECIRCULATING LINE FALLS BELOW 100 DEG. F (ADJ.). PUMP SHALL CONTINUE TO RUN UNTIL RECIRCULATING LINE TEMPERATURE RISES ABOVE 112 DEG. F (ADJ.)
- 1.4 140 DEG. RECIRCULATING PUMP RP-2 SHALL ENERGIZE IF WATER TEMPERATURE IN RECIRCULATING LINE FALLS BELOW 130 DEG. F (ADJ.). PUMP SHALL CONTINUE TO RUN UNTIL RECIRCULATING LINE TEMPERATURE RISES ABOVE 142 DEG. F (ADJ.)
- 1.5 THE THREE WAY MIXING VALVE SHALL MODULATE TO MAINTAIN 110 DEG. F (ADJ.) IN THE DHWS LOOP.

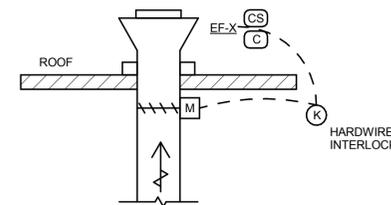
#### DOMESTIC HOT WATER POINT LIST

POINT	DI	DO	AI	AO	CALCULATED
DOMESTIC WATER 110 DEG. F ENTERING WATER SENSOR TEMPERATURE			X		
DOMESTIC WATER 110 DEG. F LEAVING WATER SENSOR TEMPERATURE				X	
DOMESTIC WATER 140 DEG. F ENTERING WATER SENSOR TEMPERATURE				X	
DOMESTIC WATER 140 DEG. F LEAVING WATER SENSOR TEMPERATURE				X	
RECIRCULATING PUMP, RP-1, RP-2 START, STOP, STATUS	X	X			
WATER HEATER MIXING VALVE				X	
WATER HEATER WH-1 LOW WATER ALARM	X	X			
WATER HEATER WH-1, WH-2 START, STOP STATUS	X	X			
WATER HEATER WH-2 LOW WATER ALARM	X	X			

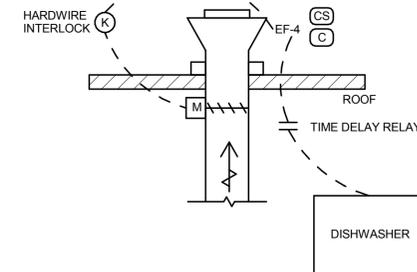
### KITCHEN HOOD MAU-1 AND EXHAUST EF-5



### EXHAUST FAN SCHEMATIC EF- 1,2, 3 AND 6



### EXHAUST FAN SCHEMATIC EF-4

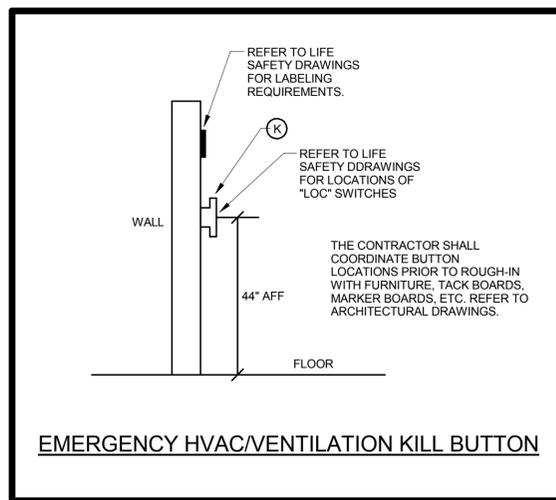


### EXHAUST FANS:

1. EF-4 (KITCHEN DISHWASHER EXHAUST FAN); EXHAUST FAN SHALL BE INTERLOCKED TO OPERATE WITH THE DISHWASHER. ISOLATION DAMPER SHALL PROVE OPEN PRIOR TO THE FAN STARTING. THIS CONTRACTOR SHALL PERFORM INTERLOCK AND MAKE OPERATIONAL. THE DDC SYSTEM SHALL READ THE FAN STATUS VIA CURRENT SENSOR AND INDICATE THE FAN OPERATION GRAPHICALLY. THE FAN SHALL RUN FOR 15 MINUTES (ADJ.) AFTER THE DISHWASHER CYCLES OFF. IF THE ISOLATION DAMPER IS COMMANDED OPEN AND THE END SWITCHES INDICATE IT IS CLOSED THEN THE FAN SHALL FAIL OFF AND ALARM AT THE BAS. HARDWARE INTERLOCK EXHAUST FAN AND ISOLATION DAMPER WITH EMERGENCY HVAC/VENTILATION KILL BUTTON.
2. EF-1, EF-2, AND EF-3 (CHEMICAL STORAGE); SHALL OPERATE 24-7. ISOLATION DAMPER SHALL PROVE OPEN PRIOR TO THE FAN STARTING. THE DDC SYSTEM SHALL READ THE FAN STATUS VIA CURRENT SENSOR AND INDICATE THE FAN OPERATION GRAPHICALLY. IF THE ISOLATION DAMPER IS COMMANDED OPEN AND THE END SWITCHES INDICATE IT IS CLOSED THEN THE FAN SHALL FAIL OFF AND ALARM AT THE BAS. HARDWARE INTERLOCK EXHAUST FAN ISOLATION DAMPER WITH EMERGENCY HVAC/VENTILATION KILL BUTTON.
3. EF-6 IS FOR THE CONCESSION STAND RESTROOM EXHAUST. THIS FAN SHALL RUN CONTINUOUSLY.

#### EXHAUST FANS POINT LIST

POINTS	DI	DO	AI	AO	CALCULATED
EXHAUST FAN START, STOP, STATUS AND RUNTIME HOURS	X	X			X
DAMPER (WHERE APPLICABLE) COMMAND AND STATUS	X	X			



### EMERGENCY HVAC/VENTILATION KILL BUTTONS:

1. UPON ACTIVATION OF THE EMERGENCY HVAC/VENTILATION KILL BUTTONS, THE FOLLOWING SHALL OCCUR:
  - THE EMERGENCY HVAC/VENTILATION KILL BUTTONS SHALL BE HARDWIRE INTERLOCKED TO ALL EXHAUST AND OUTDOOR AIR FANS AND ASSOCIATED DAMPERS.
  - THE KILL BUTTONS SHALL BE WIRED FOR A NORMALLY CLOSED CIRCUIT.
  - UPON ONE BUTTON ACTIVATION THE FOLLOWING FANS SHALL TURN OFF AND DAMPERS SHALL CLOSE 100% VIA HARDWIRE INTERLOCKS.
  - THE GAS SOLENOID VALVE FOR SCIENCE LABS AND KITCHENS SHALL BE CLOSED. THIS SHALL BE HARDWIRED AND NOT SOFTWARE INTERLOCKED.
  - THE BAS SHALL MONITOR THE STATUS OF THE EMERGENCY HVAC/VENTILATION KILL BUTTONS.
  - UPON ONE BUTTON ACTIVATION THE HEAT PUMPS SHALL BE TUENED OFF VIA SOFTWARE INTERLOCK. THE DAMPERS SHALL FULLY CLOSE IN 30 SECONDS.

#### EMERGENCY HVAC/VENTILATION KILL BUTTONS

POINTS	DI	DO	AI	AO	HARDWIRE INTERLOCK
OA-1 SUPPLY FAN AND OUTSIDE AIR DAMPER COMMAND AND STATUS	X	X			X
OA-1 EXHAUST FAN AND OUTSIDE AIR DAMPER COMMAND AND STATUS	X	X			X
OA-2 SUPPLY FAN AND OUTSIDE AIR DAMPER COMMAND AND STATUS	X	X			X
OA-2 EXHAUST FAN AND OUTSIDE AIR DAMPER COMMAND AND STATUS	X	X			X
EF-1 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-2 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-3 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-4 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-5 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-6 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-7 EXHAUST FAN COMMAND AND STATUS	X	X			X
EF-8 EXHAUST FAN COMMAND AND STATUS	X	X			X
GAS VALVE COMMAND AND STATUS	X	X			X
MAU-1 ISOLATION DAMPER COMMAND AND STATUS	X	X			X
MAU-2 ISOLATION DAMPER COMMAND AND STATUS	X	X			X
ALL HEAT PUMPS	X	X			

APPR. DATE

SYN. DESCRIPTION

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100 North 6th Street  
Philadelphia, PA 19106-1590  
Tel: 215-923-2020 Fax: 215-574-0822

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

BDH LMM KDM

PM/CM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

NAVAL FACILITIES ENGINEERING COMMAND  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
DOD/EA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

REPLACE QUANTICO M/H SCHOOL

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated  
PROJECT NO.: P-021  
CONSTR. CONTR. NO.: W91236-15-C-0023  
NAVFAC DRAWING NO.: 13091278  
SHEET 524 OF 789  
M808

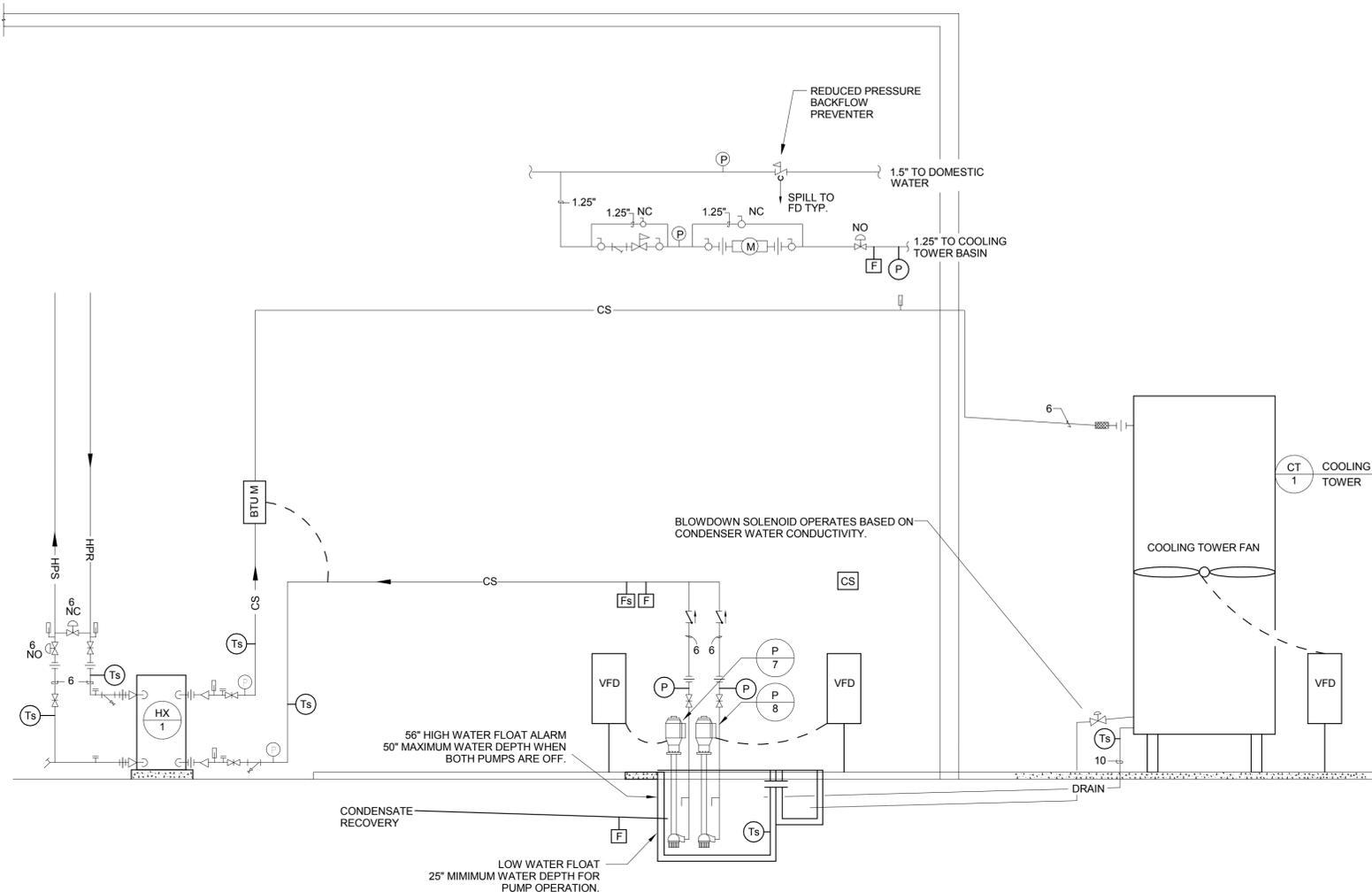
FORM REVISION: 10 MARCH 2009

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COOLING TOWER SCHEMATIC  
NTS

COOLING TOWER SYSTEM POINTS LIST					
POINTS	DI	DO	AI	AO	CALCULATED
P-7, P-8 START, STOP, STATUS, AND RUNTIME HOURS	X	X			X
CONDENSER WATER DRAIN LINE TEMPERATURE			X		
REMOTE COOLING TOWER BASIN FLUID TEMPERATURE			X		
CONDENSER SUPPLY HX-1 LEAVING TEMPERATURE			X	X	
HPR HX-1 ENTERING TEMPERATURE			X		
COOLING TOWER FAN START, STOP, STATUS, RUNTIME HOURS	X	X			X
DOMESTIC WATER MAKE-UP FILL LINE STATUS, FLOW RATE, ALARM, SILENCE	X	X	X		
CONDENSATE RECOVERY FLOW RATE			X		
BLOWDOWN SOLENOID STATUS	X				
CONDENSER SUPPLY WATER FLOW RATE (GPM)			X		
CONDENSER SUPPLY PRESSURE P-7 AND P-8			X		
CONDENSER SUPPLY ENTERING AND LEAVING PRESSURE AT HX-1			X		
COOLING TOWER BASIN HIGH WATER ALARM AND SILENCE	X	X			
HEAT EXCHANGER CONTROL VALVE				X	
CONDENSER RETURN HX-1 ENTERING TEMPERATURE			X	X	
HPS HX-1 LEAVING TEMPERATURE			X		
BTU METER CONDENSING WATER REAL TIME READING	X				
BTU METER CONDENSING WATER PEAK MEASUREMENT					X
BTU METER CONDENSING WATER WEEKLY MEASUREMENT					X
BTU METER CONDENSING WATER ANNUAL MEASUREMENT					X

COOLING TOWER SYSTEM:

- THE SYSTEM SHALL OPERATE UNDER THE CONTROL OF A LOCAL, STAND-ALONE, MICROPROCESSOR BASED BAS CONTROLLER FIELD INSTALLED ADJACENT TO THE INDOOR REMOTE SUMP PIT. IF COMMUNICATION IS LOST BETWEEN THE BAS AND THE CONTROLLER, THEN THE CONTROLLER SHALL BE PLACED INTO UNOCCUPIED MODE WHERE PUMPS P-7 AND P-8 SHALL REMAIN OFF AND COOLING TOWER CT-1 FAN IS OFF. IN THE UNOCCUPIED MODE:
  - CT-1 FAN IS OFF.
  - PUMPS P-7 AND P-8 ARE OFF.
- WHEN PLACED INTO THE OCCUPIED MODE, THE FOLLOWING SHALL OCCUR IN SEQUENTIAL ORDER.
  - WATER TEMPERATURE OF THE HPR LINE BEFORE HX-1 SHALL BE MEASURED. IF HPR WATER TEMPERATURE IS BELOW 85 DEGREES F COOLING TOWER SYSTEM SHALL REMAIN OFF DURING OCCUPIED MODE. IF HPR WATER TEMPERATURE IS 85 DEGREES OR GREATER COOLING TOWER SYSTEM SHALL BE ACTIVATED IN OCCUPIED MODE IN THE FOLLOWING SEQUENCE.
    - HEAT EXCHANGER NORMALLY OPEN CONTROL VALVE IN HPR LINE SHALL OPEN AND NORMALLY CLOSED BYPASS CONTROL VALVE IN HPR LINE SHALL CLOSE. IF HPR WATER TEMPERATURE IS BELOW 80 DEGREES F BYPASS CONTROL VALVE SHALL OPEN AND HEAT EXCHANGER CONTROL VALVE SHALL CLOSE.
    - THE CONDENSER WATER PUMPS P-7 AND P-8 SHALL BE ACTIVATED.
    - P-7 OR P-8 AND ASSOCIATED VFD SHALL START AND OPERATION SHALL BE PROVEN VIA FLOW SWITCH. PUMP SHALL OPERATE CONDENSER WATER SUPPLY AT THE CONSTANT SCHEDULED FLOW RATE. PUMPS SHALL BE LEAD LAG AND SCHEDULED TO SWITCH LEAD LAG OPERATION ON A MONTHLY BASIS.
    - CONDENSER SUPPLY WATER TEMPERATURE SHALL BE MEASURED IN CONDENSER SUPPLY WATER LINE PRIOR TO FLOWING THRU HX-1 AND SHALL CONTROL THE OPERATION OF THE COOLING TOWER FAN.
    - COOLING TOWER FAN SHALL ACTIVATE VIA VFD WHEN CONDENSER SUPPLY WATER TEMPERATURE IS EQUAL TO OR GREATER THAN 80 DEGREES F (ADJ.).
    - COOLING TOWER FAN SHALL MODULATE SPEED TO MAINTAIN A TEMPERATURE OF 80 DEGREES F (ADJ.) IN THE CONDENSER SUPPLY WATER LINE PRIOR TO HX-1.
    - COOLING TOWER SHALL ALARM IF A TEMPERATURE OF 95 DEGREES F OR GREATER (ADJ.) IS DETECTED IN THE SUMP PIT, 10" DRAIN LINE, AND OR THE CONDENSER WATER SUPPLY LINE PRIOR TO HX-1 FOR A MINIMUM OF 10 MINUTES CONTINUOUSLY.
    - COOLING TOWER SYSTEM SHALL DEACTIVATE WHEN HPR FLUID PRIOR TO HX-1 FALLS BELOW 80 DEGREES F.
  - IF NO WATER FLOW IS SENSED BY FLOW METER, THEN AN ALARM SIGNAL SHALL BE GENERATED. A 30 SECOND TIME DELAY SHALL BE PROVIDED TO PREVENT FALSE ALARMS.
  - A LOW WATER FLOAT AT 25" AFF OF THE REMOTE SUMP BASIN SHALL ACTIVATE THE NO FILL LINE SOLENOID VALVE UNTIL WATER LEVEL IS 30" AFF IN THE REMOTE SUMP BASIN.
  - A HIGH WATER FLOAT ALARM AT 56" AFF OF THE REMOTE SUMP BASIN SHALL ALARM IF THE FLOAT IS DETECTED AT 56" AFF IN THE REMOTE SUMP BASIN.
  - PROVIDE TWO (2) CHEMICAL FEED PUMPS, ELECTRONIC WATER METER, BLEED-OFF FLOW CONTROL VALVE AND CONDUCTIVITY CONTROLLER. THE CONDUCTIVITY CONTROLLER SHALL ACTIVATE THE BLEED-OFF SOLENOID VALVE AS REQUIRED TO MAINTAIN THE TOTAL DISSOLVED SOLIDS (TDS) LEVEL WITHIN ACCEPTABLE RANGES. THE CONDUCTIVITY CONTROLLER SHALL HAVE AN INTEGRAL SEVEN (7) DAYS, 24 HOUR TIMER FOR THE BIOCIDES FEED PUMP CONTROL. WHEN THE BIOCIDES FEED PUMP IS ACTIVATED, THE BLEED-OFF SOLENOID VALVE SHALL BE LOCKED OUT. THE CONDUCTIVITY CONTROLLER SHALL ALSO MEASURE THE AMOUNT OF MAKE-UP WATER BEING SUPPLIED INTO THE SYSTEM AND CONDENSATE BEING SUPPLIED INTO THE SYSTEM INDIVIDUALLY AND ACTIVATE THE SCALE INHIBITOR FEED PUMP AS REQUIRED TO MAINTAIN ACCEPTABLE LEVELS.
 

PROVIDE CHEMICAL FEED PUMPS (SCALE INHIBITOR PUMP AND IODIDE PUMP). THE PUMPS SHALL BE AN ADJUSTABLE METERING TYPE. THE PUMPS SHALL BE FULLY GROUNDED. THE PUMPS SHALL BE CONTROLLED BY THE CONDUCTIVITY CONTROLLER. THE PUMPS SHALL BE PROVIDED WITH ALL REQUIRED TUBING FOR SYSTEM INTERCONNECTION. THE ELECTRICAL CHARACTERISTICS SHALL BE 120V/1Ø/60 HZ.

PROVIDE A ONE YEAR TREATMENT PROGRAM, FROM THE DATE OF SUBSTANTIAL COMPLETION, FOR THE OPEN RECIRCULATING TOWER SYSTEM. FURNISH ONE YEAR SUPPLY OF CHEMICALS FOR CONTROL OF SCALE AND CORROSION. FIELD SERVICE AND REPORTS FOR THE OPEN RECIRCULATING TOWER SYSTEM SHALL BE AS STATED ABOVE FOR THE CLOSED LOOP SYSTEM, EXCEPT FIELD SERVICE SHALL OCCUR AND REPORTS SHALL BE SUBMITTED ON A MONTHLY BASIS IN LIEU OF QUARTERLY.
  - BTU METER SHALL BE BACNET MS/TP COMPATIBLE. UNIT SHALL HAVE DIFFERENTIAL TEMPERATURE ACCURACY +/- 15 DEG F OVER THE CALIBRATION RANGE WITH COMPUTING NONLINEARLY WITHIN +/- 0.05%. MEMORY SHALL BE NON-VOLATILE EEPROM TO RETAIN ALL PARAMETERS AND TOTALIZED VALUES IN THE EVENT OF A POWER LOSS. PROVIDE BTU METER WITH LCD DISPLAY FOR TOTAL ENERGY, FLOW RATE, SUPPLY AND RETURN TEMPERATURES OF CONDENSER WATER (SEE CONTROL DRAWING); PROVIDE N.I.S.T. TRACEABLE CALIBRATION CERTIFICATION.

MAKE-UP WATER ALARM AND SHUTDOWN:

- ON THE MAKE-UP WATER LINE, A LINE SIZED TWO-WAY, TWO-POSITION NORMALLY OPEN VALVE SHALL CLOSE IF (AFTER A TIME DELAY OF TWO MINUTES) THE MAKE-UP WATER CONTINUES FLOWING AT A RATE OF 3 GALLONS PER MINUTE OR IF THE PRESSURE DROPS BELOW 12 PSI (ADJ.) WHILE THE SYSTEM SWITCH IS IN THE NORMAL OPERATING POSITION. AN ALARM SHALL BE SENT TO THE BAS. AN AUDIBLE ALARM MOUNTED ON THE CONTROL PANEL (MOUNTED VERY NEAR THE MAKE-UP NETWORK) SHALL SOUND AND AN INDICATOR LIGHT WILL PROVIDE VISUAL INDICATION OF A PROBLEM. A MOMENTARY PUSH BUTTON ON THE PANEL SHALL BE USED TO SILENCE/ACKNOWLEDGE THE ALARM AND RESET SYSTEM FOR NORMAL OPERATION AFTER ANY NECESSARY REPAIRS ARE MADE. A SWITCH MOUNTED ON THE PANEL SHALL BE USED TO SHUT DOWN THE ALARM WHILE NORMAL SYSTEM FILL OPERATIONS ARE PERFORMED. THIS SWITCH AND ALL PANEL MOUNTED DEVICES ARE TO BE APPROPRIATELY LABELED. PROVIDE AND COORDINATE INSTALLATION BY MECHANICAL CONTRACTOR THE VALVE AND ONICON MODEL F-1310 INLINE TURBINE FLOW METER, FLOW METER TO BE LINE SIZED WITH UNION BODY, SCALED 0-10 GPM RANGE IS 0-10 VOLT OUTPUT.

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

BDH BOH KDM

PM/DM

BRANCH MANAGER

CHIEF ENR/ARCH

FIRE PROTECTION

NAVAL FACILITIES ENGINEERING COMMAND

NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON

DDISA

MARINE CORPS BASE QUANTICO, VIRGINIA

QUANTICO, VA

REPLACE QUANTICO M/H SCHOOL

TEMPERATURE CONTROLS SCHEMATICS

SCALE: 1/8" = 1'-0"

PROJECT NO.: P-021

CONSTR. CONTR. NO. W91236-15-C-0023

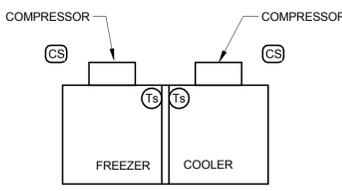
NAVFAC DRAWING NO. 13091279

SHEET 525 OF 789

M809

DRAWING REVISION: 10 MARCH 2020

METERING POINTS LIST					
POINTS	DI	DO	AI	AO	CALCULATED
BTU DEMAND			X		
BTU METER INPUT			X		
BTU PEAK MONTH-TO-DATE			X		
BTU PEAK TODAY			X		
BTU PEAK YEAR-TO-DATE			X		
BTU USAGE TODAY			X		
BTU YEAR-TO-DATE			X		
ELECTRIC APPARENT POWER - KVA			X		
ELECTRIC CURRENT NEUTRAL			X		
ELECTRIC CURRENT PHASE A			X		
ELECTRIC CURRENT PHASE B			X		
ELECTRIC CURRENT PHASE C			X		
ELECTRIC DEMAND LEVEL 1				X	
ELECTRIC DEMAND LEVEL 2				X	
ELECTRIC DEMAND LEVEL 3				X	
ELECTRIC FREQUENCY			X		
ELECTRIC POWER FACTOR			X		
ELECTRIC REAL ENERGY - KWH			X		
ELECTRIC REAL POWER - KW			X		
ELECTRIC VOLTAGE A-B			X		
ELECTRIC VOLTAGE A-N			X		
ELECTRIC VOLTAGE B-C			X		
ELECTRIC VOLTAGE B-N			X		
ELECTRIC VOLTAGE C-A			X		
ELECTRIC VOLTAGE C-N			X		
GAS DEMAND			X		
GAS FLOW RATE			X		
GAS PEAK MONTH-TO-DATE			X		
GAS PEAK TODAY			X		
GAS PEAK YEAR-TO-DATE			X		
GAS USAGE MONTH-TO-DATE			X		
GAS USAGE TODAY			X		
GAS USAGE YEAR-TO-DATE			X		
WATER DEMAND			X		
WATER FLOW RATE			X		
WATER PEAK MONTH-TO-DATE			X		
WATER PEAK TODAY			X		
WATER PEAK YEAR-TO-DATE			X		
WATER USAGE MONTH-TO-DATE			X		
WATER USAGE TODAY			X		
WATER USAGE YEAR-TO-DATE			X		



**KITCHEN REFRIGERATOR AND FREEZER**

**KITCHEN REFRIGERATOR AND FREEZER**

1. PROVIDE A WALL-MOUNTED THERMO-BUFFER TEMPERATURE SENSOR IN THE WALK-IN REFRIGERATOR AND FREEZER UNITS TO MONITOR TEMPERATURE.
2. IF THE TEMPERATURES EXCEED A PRE-DESIGNATED SETPOINT (ADJ.), AN ALARM SHALL BE GENERATED.

AIR COOLED REFRIGERATOR AND FREEZER POINTS LIST					
POINTS	DI	DO	AI	AO	CALCULATED
COMPRESSOR(S) START, STOP, STATUS AND RUNTIME HOURS	X	X			X
SPACE TEMPERATURE(S) FREEZER/COOLER			X		
GENERAL ALARM	X				

**LIGHTING CONTROL SYSTEM:**

1. LIGHTING RELAY CONTROL (LRC) PANELS SHALL BE PROVIDED BY THE CONTROLS CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. COORDINATE WORK SO THAT A FULLY OPERATIONAL SYSTEM IS PROVIDED TO THE OWNER. LRC PANELS SHALL BE PROVIDED WITH BACNET MS/TP PROTOCOL ADD-ON MODULE. THE LRC PANELS SHALL BE BACNET MS/TP CAPABLE, AND SHALL HAVE 25 STANDARD PROGRAMMABLE SWITCH INPUTS, (1) ANALOG INPUT FOR PHOTO SENSORS, (2) OUTPUT TERMINALS, NUMBER OF RELAYS PER SCHEDULES, INPUT TIMERS, MANUAL OVERRIDE AND A 2-YEAR STANDARD WARRANTY.
2. PROVIDE A FULL GRAPHIC PAGE OF THE BUILDING AND SITE LIGHTING ZONES, INDICATING THE DIFFERENT ZONES THAT CAN BE SCHEDULED. 'A' ZONES ARE INTERIOR, 'B' ZONES ARE EXTERIOR. A GRAPHIC "LIGHT BULB" LOCATED IN THE SPECIFIC AREA SHALL INDICATE WHETHER LIGHTS ARE ON OR OFF.
3. INTERIOR LIGHTING ZONES INDICATED ON SCHEDULES SHALL BE CONTROLLED VIA DIGITAL TIME CLOCK AND OCCUPANCY SENSORS. EXTERIOR LIGHTING ZONES INDICATED ON SCHEDULES SHALL BE CONTROLLED BY PHOTOCELL AND INDEPENDENTLY SCHEDULED BY DIGITAL BAS TIME CLOCK AS DIRECTED BY THE CONTRACTING OFFICER'S REPRESENTATIVE.

**ELECTRICAL SWITCHGEAR/POWER INTERFACE:**

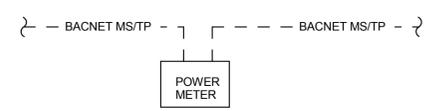
1. THERE IS ONE POWER METER LOCATED IN THE MAIN SWITCHGEAR.
2. THE ELECTRICAL SWITCHGEAR SHALL BE MONITORED THROUGH THE DDC SYSTEM VIA MOD BUS CONNECTION. COORDINATE THE INTERFACE WITH THE SWITCHGEAR MANUFACTURER. CONTROL WIRING TO THE POWER METER TO BE PROVIDED BY THE TCC.

**POWER (KW) DEMAND LIMITING:**

1. THE GOAL OF THE DEMAND LIMITING IS TO SAVE OPERATING COSTS BY CONTROLLING & LIMITING PEAK ENERGY USAGE. THE SEQUENCE SELECTIVELY TURNS OFF EQUIPMENT AND/OR ADJUSTS SETPOINTS TO LIMIT ENERGY USE DURING PERIODS OF THE DAY THAT ARE TRADITIONALLY PEAK TIMES.
2. THE UTILITY BUILDING KW DEMAND SHALL BE MONITORED BY THE BAS. THE BUILDING KW TARGET SHALL INITIALLY BE SET TO 450 KW (ADJ.) AND SHALL BE VERIFIED WITH THE CONTRACTING OFFICER. THE KW TARGET IS THE MAXIMUM PERMITTED AVERAGE ENERGY FOR THE CURRENT DEMAND INTERVAL. THE CURRENT DEMAND INTERVAL IS THE DURATION IN MINUTES OVER WHICH ENERGY CONSUMPTION IS AVERAGED FOR BILLING PURPOSES. THE BAS SOFTWARE SHALL PREDICT DEMAND FOR THE DEMAND INTERVAL. IF THE PREDICTED DEMAND IS ABOVE THE CURRENTLY ACTIVE TARGET, DEMAND LIMITING SHEDS THE LOADS AS SPECIFIED.
3. PROVIDE A GRAPHIC RELEASE FEATURE TO RELEASE THE EQUIPMENT AT THE BAS WITH A MANUAL COMMAND. COORDINATE WITH CONTRACTING OFFICER THE SHED TIME AND ADDITIONAL EQUIPMENT TO INCLUDE WITHIN DEMAND LIMITING.
4. AT PERIODS OF PEAK USAGE, RESET THE SPACE TEMPERATURE SETPOINT BY 3 DEGREES F (ADJ.) IN HEATING OR COOLING MODE. THE SHED TIME SHALL BE 20 MINUTES (ADJ.) FOR EACH GROUP. EACH SUBSEQUENT GROUP SHALL FOLLOW IN 5 MINUTE (ADJ.) INCREMENTS. THIS ROUTINE SHALL START WITH THE DEMAND REACHES 80% (ADJ.) OF SETPOINT AND SHALL OPERATE UNTIL ALL GROUPS COMPLETE AT LEAST ONE ROTATION. IF AT THE END OF ONE ROTATION, THE DEMAND IS STILL WITHIN 80% (ADJ.) OF SETPOINT, THE SEQUENCE SHALL REPEAT AS NEEDED.

**POWER MONITORING:**

1. THERE ARE POWER METERS FOR MONITORING CONSUMPTION THROUGHOUT THE FACILITY. REFER TO POWER DRAWINGS FOR ADDITIONAL INFORMATION. POWER METERS SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR WITH BACNET MS/TP PROTOCOL.



**EMERGENCY GENERATOR:**

1. THE DDC SHALL MONITOR THE STATUS OF THE GENERATOR AS WELL AS LOW FUEL LEVEL IN THE GENERATOR. THE TWO (2) AUTOMATIC TRANSFER SWITCHES SHALL HAVE THEIR STATUS MONITORED AS WELL. THE EMERGENCY GENERATOR SHALL BE ABLE TO COMMUNICATE TO THE DDC SYSTEM VIA BACNET OVER MSTP AND ALL POINTS SHALL BE AVAILABLE TO THE DDC SYSTEM.

EMERGENCY GENERATOR POINTS LIST					
POINTS	DI	DO	AI	AO	CALCULATED
APPARENT POWER - KVA			X		
AUTOMATIC TRANSFER SWITCH 1	X				
AUTOMATIC TRANSFER SWITCH 2	X				
FREQUENCY			X		
GENERATOR ALARM	X				
GENERATOR ENABLE		X			
GENERATOR STATUS	X				
POWER FACTOR			X		
REAL ENERGY - KWH			X		
REAL POWER - KW			X		

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APPR. DATE

SYN. DESCRIPTION

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AE INFO

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SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENG/ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON DODEA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: As indicated

PROJECT NO.: P-021

CONSTR. CONTR. NO.: W91236-15-C-0023

NAVFAC DRAWING NO.: 13091280

SHEET 526 OF 789

M810

DRAWING REVISION: 10 MARCH 2016



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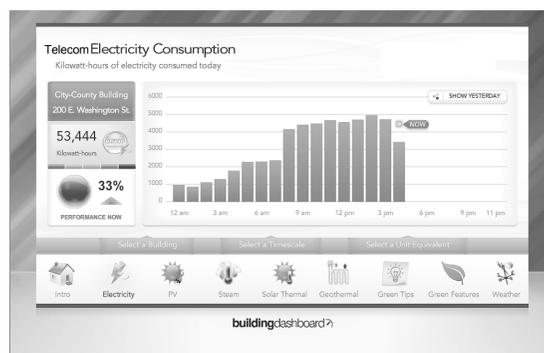
### BUILDING TOTAL USAGE



REMARKS:

- PROVIDE GREEN CONVERSIONS CALCULATOR FOR DIFFERENT EXAMPLES OF ENERGY USAGE.
  - A. TYPICAL FOR MINIMUM OF 8 DIFFERENT EQUIVALENTS.

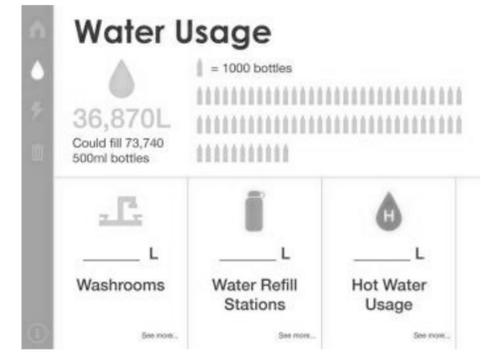
### TELECOM ENERGY USAGE



REMARKS:

- PROVIDE CALCULATOR FOR TELECOM ENERGY USAGE.

### BUILDING WATER USAGE



REMARKS:

- PROVIDE WATER USAGE METER OUTPUT.

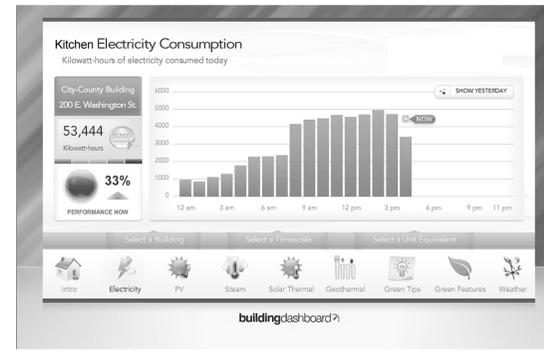
### CURRICULUM INTEGRATION



REMARKS:

- TEACHING PAGES TO CORRELATE ENERGY USAGE TO OTHER ENERGY PRODUCING APPLICATIONS.

### KITCHEN ENERGY USAGE



REMARKS:

- PROVIDE KITCHEN ENERGY OUTPUT.

**ENERGY DASHBOARD:**

GRAPHICS ARE NOT SPECIFIC TO QUANTICO MIDDLE/HIGH SCHOOL. THEY ARE PROVIDED AS A SAMPLE OF CUSTOM COLOR ANIMATED GRAPHICS TYPICAL FOR THIS PROJECT. THE CONTRACTOR SHALL DEVELOP CUSTOM ANIMATED GRAPHICS AND THE LINKS SPECIFIC FOR THIS PROJECT. DESCRIPTIONS OF GRAPHIC CONTENT IS PROVIDED FOR REFERENCE. GRAPHIC CONTENT SHALL BE PROVIDED TO THE CONTRACTING OFFICER FOR REVIEW AND CONTENT APPROVAL.

THE CONTRACTOR SHALL COMMISSION THIS SYSTEM 30 DAYS PRIOR TO SUBSTANTIAL COMPLETION. THIS SHALL INCLUDE CONFIRMATION THAT THE METERS ARE READING ACCURATELY. THE CONTRACTOR SHALL INSTALL A DATA LOGGER FOR 14 DAYS MINIMUM TO COMPARE AGAINST THE METERED DATA PROVIDED TO THE DASHBOARD SYSTEM.

APPR	
DATE	
DESCRIPTION	
SYM	

**EWING COLE**  
Federal Reserve Bank Building  
100 North 6th Street  
Philadelphia, PA 19106-1590  
Tel: 215-923-2020 Fax: 215-574-0852

AE INFO

APPROVED

FOR COMMANDER NAVFAC ACTIVITY

SATISFACTORY TO DATE

CRK LMM/CRK KDM

PM/DM

BRANCH MANAGER

CHIEF ENGR ARCH

FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND  
NAVAL FACILITIES ENGINEERING COMMAND - WASHINGTON  
DOD/EA  
MARINE CORPS BASE QUANTICO, VIRGINIA  
QUANTICO, VA

**REPLACE QUANTICO M/H SCHOOL**

TEMPERATURE CONTROLS SCHEMATICS

SCALE: 1/8" = 1'-0"

PROJECT NO.: P-021

CONSTR. CONTR. NO.: W91236-15-C-0023

NAVFAC DRAWING NO.: 13091282

SHEET 528 OF 789

M812

DRAWING REVISION: 10 MARCH 2016

D

C

B

A

OA-1 VENTILATION SCHEDULE - AREA A						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
A1.1	1C46	CIRCULATION	25	25	0	0
	1C55	MENS DRESSING ROOM	0	0	0	50
	1C57	WOMENS DRESSING ROOM	0	0	0	50
	1C59	STAGE STORAGE	15	15	0	0
A1.2	1C47.1	STAGE	65	65	0	0
A1.3	1C47	PERFORMANCE	905	145	720	0
	2C13	PERFORMANCE CONTROL ROOM	10	10	0	0
A1.4	1C49	MUSIC	430	430	370	0
	1C50	MUSIC PRACTICE	20	20	0	0
	1C51	MUSIC LIBRARY	5	5	0	0
	1C52	MUSIC STORAGE	30	30	0	0
A1.5	1C41	MS CTE	410	165	0	0
A1.6	1C38	ART STORAGE	40	40	0	150
	1C39	ART	460	460	0	815
	1C40	KILN	20	20	0	70
A1.7	1C53	MECH 4	0	0	0	0
A1.8	1S05	STAIR 5	0	0	0	0
A1.9	1C00	ENTRY CORRIDOR	205	205	0	0
	1C43	JANITORS CLOSET	0	0	0	50
	1C44	WOMENS TOILET	0	0	0	490
	1C45	MENS TOILET	0	0	0	490
	2C16	CIRCULATION	30	30	0	0
	2F108	MS CTE HUB	20	20	0	0
	2C09	COMP CENTER	500	500	0	0
	2C10	WOMENS TOILET	0	0	0	490
A2.1	2C11	MENS TOILET	0	0	0	490
	2C15	CIRCULATION	100	100	0	0
A2.2	2C00	CIRCULATION	40	40	0	0
	2C01	INFO CENTER	355	115	0	0
A2.3	2C12	MECH	0	0	0	0
A2.4	2S05	STAIR 5	0	0	0	0
			3,685	2,440	1,090	3,145

OA-1 VENTILATION SCHEDULE - AREA B						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
B2.1	2C02	STAFF COLLABORATION	50	20	50	0
	2C03	INFO WORKROOM	15	15	0	0
B2.2	2C05	HS CTE	410	120	325	0
B2.3	2C06	TR 5	0	0	0	0
B2.4	2C08	MECH	0	0	0	0
B2.5	2S02	STAIR 2	0	0	0	0
B2.6	2C04	VIDEO BROADCASTING	30	30	0	0
	2C07	HS CTE HUB	125	45	100	0
			630	230	475	0

OA-1 VENTILATION SCHEDULE - AREA D						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
D1.1	1D06	HS CHEMISTRY	1,140	1,140	0	1,140
	1D08	LEARNING STUDIO 1	345	95	225	0
D1.2	1D10	LEARNING STUDIO 2	345	95	225	0
D1.3	1D00	HS HUB 1	320	135	255	0
	1D02	HS ONE TO ONE 1	30	10	20	0
D1.4	1D12	LEARNING STUDIO 3	345	95	225	0
	1D14	LEARNING STUDIO 4	345	95	225	0
D1.5	1E00	STAFF COLLABORATION WORK	175	95	140	0
	1E01	STAFF COLLABORATION STORAGE	25	25	20	0
	1E01.1	STAFF COLLABORATION HUB	90	30	70	0
	1E02	MEN'S TOILET	0	0	0	70
	1E03	WOMEN'S TOILET	0	0	0	70
	1E04	KITCHENETTE	10	10	0	45
1E05	CENTRAL WORKROOM 1	10	10	0	0	
D1.6	1B01	MS LI - MILD/MODERATE	135	55	105	0
	1B03	MS GROUP LEARNING 2	55	15	40	0
	1D01	FLEX HUB	120	45	95	0
	1D07	HS ACADEMIC SUPPORT 1	185	55	145	0
D1.7	1D09	HS GROUP LEARNING 1	75	15	60	0
	1D11	ONE TO ONE	30	10	20	0
D1.8	1D16	LEARNING STUDIO FLEX 1	345	95	225	0
	1D18	LEARNING STUDIO FLEX 2	345	95	225	0
D1.8	1S04	STAIR 4	0	0	0	0
D1.9	1E06	TR 2	0	0	0	0
D1.10	1D13	MECH6	0	0	0	0
D1.11	1E07	MECH 5	0	0	0	0
D1.12	1D03	SCI PREP 1	55	55	0	295
	1D04	HS PHYSICAL SCIENCE	390	140	75	0
	1D05	CHEM	0	0	0	240
D2.1	2D02	LI - MODERATE/SEVERE - INSTRUCTIONAL AREA	250	120	200	0
	2D02.1	LIMS - KITCHEN	35	35	0	0
	2D02.2	LIMS - TOILET	0	0	0	70
	2D02.3	LIMS - SHOWER	0	0	0	120
D2.2	2D08	LEARNING STUDIO 9	345	95	225	0
	2D10	LEARNING STUDIO 10	345	95	225	0
D2.3	2D12	LEARNING STUDIO 11	345	95	225	0
	2D14	LEARNING STUDIO 12	345	95	225	0
D2.4	2D00	HS HUB 2	340	115	270	0
	2D04	HS ONE TO ONE 1	55	15	0	0
	2D06	HS GROUP LEARNING 1	65	15	0	0
	2C14	ASAC	25	10	0	0
D2.5	2E00	STAFF COLLABORATION WORK 2	175	95	50	0
	2E01	STAFF COLLABORATION STORAGE	25	25	0	0
	2E02	MEN'S TOILET	0	0	0	70
	2E03	WOMEN'S TOILET	0	0	0	70
	2E04	KITCHENETTE	10	10	0	40
	2E05	CENTRAL WORKROOM 2	10	10	0	0
	2F485	STAFF COLLABORATION HUB 2	80	30	0	0
	2E06	TR 4	0	0	0	0
D2.7	2B01	MS ACADEMIC SUPPORT 2	90	25	70	0
	2B03	MS GROUP LEARNING 2	70	15	0	0
	2D01	FLEX HUB	120	45	95	0
	2D03	HS LI - MILD/MODERATE	180	50	140	0
D2.8	2D05	HS ACADEMIC SUPPORT 2	90	25	70	0
	2D07	MS GROUP LEARNING 1	65	15	0	0
D2.9	2D16	LEARNING STUDIO FLEX 3	345	95	225	0
	2D18	LEARNING STUDIO FLEX 4	345	95	225	0
D2.10	2E07	MECH	0	0	0	0
D2.11	2D09	MECH 9	0	0	0	0
D2.11	2S04	STAIR 4	0	0	0	0
Default	1C00b	VESTIBULE	0	0	0	0
			8,670	3,640	4,640	2,230

OA-1 VENTILATION SCHEDULE - AREA E						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
E1.1	1B12	LEARNING STUDIO 6	345	95	225	0
	1B14	LEARNING STUDIO 5	345	95	225	0
E1.2	1B08	LEARNING STUDIO 8	350	100	225	0
	1B10	LEARNING STUDIO 7	345	95	225	0
E1.3	1B00	MS HUB 1	320	135	255	0
E1.4	1B02	OT/PT (GROSS)	125	55	100	0
	1B04	MS ONE TO ONE 2	35	10	0	0
	1B06	OT/PT (FINE)	70	30	55	0
E1.5	1B05	FIRE	0	0	0	0
E1.6	1S03	STAIR 3	0	0	0	0
E1.7	1B07	MECH 7	0	0	0	0
E2.1	2B00	MS HUB 2	355	120	280	0
	69	CIRC	45	45	0	0
E2.2	2B14	LEARNING STUDIO 14	345	95	225	0
	2B16	LEARNING STUDIO 13	345	95	225	0
E2.3	2B04	MS SCIENCE	470	220	345	0
	2B06	SCI PREP 2	40	40	0	0
E2.4	2B02	READING LAB	95	30	75	0
	2B08	MS ONE TO ONE 2	30	10	0	0
E2.5	2B10	LEARNING STUDIO 16	350	100	225	0
	2B12	LEARNING STUDIO 15	345	95	225	0
E2.6	2S03	STAIR 3	0	0	0	0
E2.7	2B05	MECH 8	0	0	0	0
			4,355	1,465	2,910	0

OA-2 VENTILATION SCHEDULE - AREA B						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
B1.1	1A27	CAREER INFO AREA	30	15	160	0
	1A29	REGISTRAR	20	10	0	0
	1A31	RECORDS	5	5	0	0
	1A33	COUNSELOR	20	10	0	0
B1.2	1A34	CONF	40	15	0	0
	1A35	PSYCH	20	10	0	0
B1.3	1A26	STORAGE	0	0	50	0
	1A28	ASSESSOR	10	10	0	0
	1A30	ASSESSMENT	10	10	0	0
	1A32	CAREER COUNSELOR	10	10	0	0
	1A17	NURSE WAITING	50	30	0	80
B1.4	1A18	NURSE	40	20	0	55
	1A19	TREATMENT AREA	95	50	0	145
	1A23	NURSE SCREENING / STORAGE	25	15	0	0
	1A25	NURSE TOILET	0	0	0	0
	1A22	TR 3	0	0	0	0
	1C01	COMMONS	1,275	225	1,000	0
B1.7	1S02	STAIR 2	0	0	0	0
B1.8	1A14	MECH 1	0	0	0	0
B1.9	1A02	PARENTS CENTER	40	15	30	0
	1A04	MEN'S TOILET	0	0	0	70
	1A06	WOMEN'S TOILET	0	0	0	70
	1A08	WORK RM	10	10	0	0
	1A10	MAIL ROOM	10	10	0	0
	1A12	ADMIN CONF	45	15	0	0
	1A01	RECEPTION	40	15	0	0
B1.10	1A03	CLERICAL	55	25	0	0
	1A05	SMSS	30	10	0	0
	1A07	ASST PRINCIPAL	35	15	0	0
	1A09	PRINCIPAL	35	15	0	0
1A11	ADMIN CIRC	10	10	0	0	
B1.11	1A16	ELEC	0	0	0	0
B1.12	1C00	ENTRY CORRIDOR	170	170	0	0
	1S01	STAIR 1	0	0	0	0
	2C18	CIRCULATION	30	30	0	0
B1.13	1A21	MECH	0	0	0	0
	1C37	MECH	0	0	0	0
			2,160	775	1,240	420

OA-2 VENTILATION SCHEDULE - AREA C						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
C1.1	1C03	GYMNASIUM SEATING	2,155	2,155	1,600	0
	1C06	SEATING	825	75	340	0
C1.2	1C08	PE STORAGE	30	25	0	0
	1C09	TRAINING ROOM	40	15	0	0
	1C11	ATHLETIC STORAGE	20	20	0	0
C1.4	1C05	MECH	0	0	0	0
C1.5	1C07	MECH	0	0	0	0
			3,070	2,290	1,940	0

OA-2 VENTILATION SCHEDULE - AREA E						
ZONE	ROOM #	ROOM NAME	MAX OA (CFM)	MIN OA (CFM)	VARIABLE EA (CFM)	CONSTANT EA (CFM)
E1.8	1C04	FOOD SERVICE	70	70	0	0
	1C13	JANITORS CLOSET	30	30	0	0</