SECTION 02 83 13.00 22

LEAD IN CONSTRUCTION (PWD ME)
**03/14**

PART 1 GENERAL

**Transport And Disposal Of Lead Materials To A Licensed Disposal Site Will Be By Separate Contract. Contractor Shall Ensure All Lead Materials Are Properly Packaged Prior To Placement Into Government Furnished Dumpsters.**

1.1 REFERENCES

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

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

| | |
|---|---|
| AIHA Z88.6 | (2006) Respiratory Protection - Respiratory Use - Physical Qualifications for Personnel |

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

| | |
|---|---|
| HUD 6780 | (1995; Errata Aug 1996;Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing |

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

| | |
|---|---|
| 29 CFR 1926.103 | Respiratory Protection |
| 29 CFR 1926.21 | Safety Training and Education |
| 29 CFR 1926.33 | Access to Employee Exposure and Medical Records |
| 29 CFR 1926.55 | Gases, Vapors, Fumes, Dusts, and Mists |
| 29 CFR 1926.59 | Hazard Communication |
| 29 CFR 1926.62 | Lead |
| 29 CFR 1926.65 | Hazardous Waste Operations and Emergency Response |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 745 | Lead-Based Paint Poisoning Prevention in Certain Residential Structures |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 586 | (2009) Standard for High-Efficiency Particulate, Air Filter Units |

1.1.1 STATE OF MAINE REGULATIONS

The following STATE OF MAINE REGULATIONS regulations are available on request to the Contracting Officer or at www.maine.gov/sos/cec/rules/06/096/096c851.doc

1.1.2 PORTSMOUTH NAVAL SHIPYARD REGULATIONS

INSTRUCTIONS

1. 5090.6D Solid Waste Plan 11/08

2. 5090.30 Hazardous Waste Generator Standards 4/05

These instructions are available upon request to the Contracting Officer.

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period.

1.2.2 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.3 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current Federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. A Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals is the best choice.

1.2.4 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.5 Decontamination Shower Facility

That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

1.2.6 High Efficiency Particulate Arrestor (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.7 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.8 Lead Control Area

A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.9 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a work day, the PEL shall be determined by the following formula:

PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day

1.2.10 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01%). An X-Ray Fluorescence (XRF) instrument is considered a valid test method.

1.2.11 Personal Sampling

Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

1.2.12 Physical Boundary

Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

1.3 DESCRIPTION

1.3.1 Description of Work

Construction activities impacting PWL or material containing lead which are covered by this specification include the demolition and/or removal of material containing lead located as indicated on the drawings. Refer to the report at the end of this Section.

1.3.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent

areas. Coordination procedures shall be explained in the Plan and shall describe how the Contractor will prevent lead exposure to other Contractors and/or Government personnel performing work unrelated to lead activities.

## 1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment); G

Lead Compliance Plan including CP approval (signature, date, and certification number); G

Competent Person qualifications; G

Training Certification of workers and supervisors; G

Lead waste management plan; G

Certification of Medical Examinations; G

SD-06 Test Reports

sampling results; G

Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing laboratory qualifications; G

Clearance Certification; G

SD-11 Closeout Submittals

Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at a sanitary or construction and demolition landfills; G

## 1.5 QUALITY ASSURANCE

### 1.5.1 Qualifications

#### 1.5.1.1 Competent Person (CP)

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard ( 29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead, experience with the use of respirators,

personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained and certified in accordance with Federal, State and local laws. The competent person shall be a licensed lead-based paint abatement Supervisor/Project Designer in the State of Maine.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62(l) and is certified to perform or supervise deleading, lead removal or demolition activities in the State of Maine.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air and wipe analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis shall be OSHA approved.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

a. Verify training meets all Federal, State, and local requirements.

b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.

c. Continuously inspect PWL or MCL work for conformance with the approved plan.

d. Perform (or oversee performance of) air sampling. Complete upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.

e. Ensure work is performed in strict accordance with specifications and all applicable regulations at all times.

f. Control work to prevent hazardous exposure to human beings and to the environment at all times.

g. Supervise final cleaning of the lead control area, take clearance wipe samples if necessary; review clearance sample results and make recommendations for further cleaning. Verify waste materials have been properly transferred, CP has responsibility to comply and verify compliance.

h. Certify the conditions of the work as called for elsewhere in this specification.

1.5.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of PWL or MCL. The plan shall include a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

The plan shall be developed by a certified planner/project designer in the State of Maine.

In occupied buildings, the plan shall also include an occupant protection program that describes the measures that will be taken during the work to protect the building occupants.

1.5.2.3 Occupational and Environmental Assessment Data Report

Submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

a. The initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. The data shall represent the worker's regular daily exposure to lead for stated work.

b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.

c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62.

1.5.2.4 Medical Examinations

Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the

action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs lead, who performs MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62, and State and local regulations where appropriate.

1.5.2.6 Respiratory Protection Program

a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.

b. Establish and implement a respiratory protection program as required by AIHA Z88.6, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.8 Lead Waste Management

The Lead Waste Management Plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations and shall address:

a. Identification and classification of wastes associated with the work.

b. Estimated quantities of wastes to be generated and disposed of.

c. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and operator and a 24-hour point of contact. Furnish two copies of USEPA and local hazardous waste permit applications, permits, manifests and USEPA Identification numbers. All HW must be placed in a Shipyard permitted HWAA or Contractors shall turn HW in to a HWAA not later than the end of the shift on which it is generated. Responsibility for compliance is upon the Contractor. All hazardous wastes generated within the confines of the Shipyard are disposed of by the Government. Accordingly, all hazardous wastes generated by the Contractor to accomplish requirements of this contract will be considered Government-generated, and disposed of by the Government. Contractor shall not bring hazardous wastes onto Government property.

d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.

h. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.

i. Unit cost for hazardous waste disposal according to this plan.

1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply. The following SHIPYARD, NAVY and STATE OF MAINE laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead-contaminated materials apply:

a. Shipyard Instruction 5090.6D Solid Waste Plan

b. Shipyard Instruction 5090.30 Hazardous Waste Generator Standards

Licensing and certification in the State of Maine is required.

1.5.3 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead Waste Management Plan and the Lead Compliance Plan, including procedures and precautions for the work.

1.6 EQUIPMENT

1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust, fume and mist. Respirators shall comply with the requirements of 29 CFR 1926.62.

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with proper disposable or uncontaminated, reusable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of any lead work.

3.1.1.2 Lead Control Area

a. Physical Boundary - Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area.

b. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.1.1.3 Furnishings

Furniture and equipment will be removed from the area of work by the Government to the greatest extent possible before lead work begins. If

furnishings and equipment are to remain in the building, cover and seal furnishings with 6-mil plastic sheet or remove from the work area and store in a location on site approved by the Contracting Officer. Reinstall furnishings and equipment after the completion of lead work.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area. Provide temporary HVAC system for areas in which HVAC has been shut down outside the lead control area.

3.1.1.5 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

3.1.1.6 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the limits of the project work area.

3.1.1.7 Mechanical Ventilation System

a. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.

b. Ensure system is connected to HEPA filters.

c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.8 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead Control Area Requirements

Establish a lead control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

Full containment - Contain removal operations by the use of critical barriers and HEPA filtered exhaust.

## 3.3 APPLICATION

### 3.3.1 Lead Work

Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when the work is performed in accordance with 29 CFR 1926.62 or 40 CFR 745, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with Federal, State, and local requirements and requirements specified herein.

### 3.3.2 Paint with Lead or Material Containing Lead Removal

Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

#### 3.3.2.1 Paint with Lead or Material Containing Lead - Indoor Removal

Perform manual or mechanical removal and thermal cutting in the lead control areas using enclosures, barriers or containments and powered locally exhausted tools. Collect residue / debris for disposal in accordance with Federal, State, and local requirements.

#### 3.3.2.2 Paint with Lead or Material Containing Lead - Outdoor Removal

Perform outdoor removal as indicated in Federal, State, and local regulations and in the Lead Compliance Plan. The worksite preparation (barriers or containments) shall be job dependent and presented in the Lead Compliance Plan.

### 3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn in the control area:

a. Vacuum all clothing before entering the contaminated change room.

b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.

c. Change to clean clothes prior to leaving the clean clothes storage area. The employer shall provide shower facilities, where feasible, for use by employees whose airborne exposure to lead is above PEL. The employer also shall assure, where shower facilities are available,

that employees shower at the end of the work shift and shall provide an adequate supply of cleansing agents and towels for use by effected employees.

d. Wash hands and face at the site, don appropriate disposable clothing, move to an appropriate shower facility, shower.

e. Change to clean clothes prior to leaving the clean clothes storage area.

## 3.4 FIELD QUALITY CONTROL

### 3.4.1 Tests

#### 3.4.1.1 Air and Wipe Sampling

Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air and wipe sampling shall be directed or performed by the CP.

a. The CP shall be on the job site directing the air and wipe sampling and inspecting the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.

b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

c. Submit results of air samples to Contracting Officer, signed by the CP, within 72 hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead-based paint removal operations are performed, in areas immediately adjacent to the lead control area. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above 30 micrograms per cubic meter of air. If 30 micrograms per cubic meter of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Removal work shall resume only after the CP and the Contracting Officer give approval.

e. Before any work begins, collect and analyze baseline wipe samples in accordance with methods defined by Federal, State, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to lead disturbance or removal.

f. Surface Wipe Samples - Collect surface wipe samples on floors at a location no greater than 10 feet outside the lead control area at a frequency of once per day while lead removal work is conducted in occupied buildings. Surface wipe results shall meet criteria in paragraph "Clearance Certification".

#### 3.4.1.2 Sampling After Removal

After the visual inspection, collect wipe samples according to the HUD protocol contained in HUD 6780 to determine the lead content of settled dust in micrograms per square meter foot of surface area.

#### 3.4.1.3 Testing of Material Containing Lead Residue

Test residue in accordance with 40 CFR 261 for hazardous waste.

## 3.5 CLEANING AND DISPOSAL

### 3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP shall then certify in writing that the area has been cleaned of lead contamination before clearance testing. Refer to Disposal Section below, regarding controls for generated waste and statements to how they will be controlled (daily transfers to HWAA/HWSF according to local requirements).

#### 3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 micrograms per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

Certify surface wipe samples are not significantly greater than the initial surface loading determined prior to work.

Clear the lead control area in industrial facilities of all visible dust and debris.

### 3.5.2 Disposal

Collect lead-contaminated waste, scrap, debris, containers, equipment, and lead-contaminated clothing and place in labeled bags for disposal. The Contractor shall label and affix a label permanently attached to the bags identifying them as "Lead Waste" and providing the following additional information:

* Abatement Contractor Name
* Construction Contract Number
* Site Location or Building Number

* Portsmouth Naval Shipyard, Kittery, Me.
* Date

**Transport And Disposal Of Lead Materials To A Licensed Disposal Site Will Be By Separate Contract. Contractor Shall Ensure All Lead Materials Are Properly Packaged Prior To Placement Into Government Furnished Dumpsters.**

All HW must be placed in a Shipyard permitted HWAA or Contractors shall turn HW in to a HWAA not later than the end of the shift on which it is generated. Responsibility for compliance is upon the Contractor. All hazardous wastes generated within the confines of the Shipyard are disposed of by the Government. Accordingly, all hazardous wastes generated by the Contractor to accomplish requirements of this contract will be considered Government-generated, and disposed of by the Government. Contractor shall not bring hazardous wastes onto Government property.

Containers positioned within the work area boundaries shall have covers in place whenever containers are not in use. Notify the Contracting Officer or his/her designated representative to remove full containers.

3.5.2.1 Disposal Documentation

Provide turn-in documents or weight tickets for non-hazardous waste disposal.

3.5.2.2 Payment for Non-Hazardous Waste

Payment for disposal of non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials or non-hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

NORTHEAST TEST CONSULTANTS

# HAZARDOUS MATERIALS ASSESSMENT for ASBESTOS & LEAD-BASED PAINT

at

## DRY DOCK #3 – PUMP WELL
## PORTSMOUTH NAVAL SHIPYARD
## KITTERY, MAINE

NTC JOB #13850-2013

Prepared by:

**NORTHEAST TEST CONSULTANTS**
**587 SPRING STREET**
**WESTBROOK, ME 04092**

Prepared for:

*Mr. Peter Dunn*
*Oak Point Associates*
*231 Main Street, P.O. Box 1259*
*Biddeford, ME 04005*

**April 21, 2014**

NORTHEAST TEST CONSULTANTS

April 21, 2014

Mr. Peter Dunn
Oak Point Associates
231 Main Street, P.O. Box 1259
Biddeford, ME 04005

RE: Hazardous Materials Assessment for Asbestos & Lead-Based Paint
**Portsmouth Naval Shipyard – DD #3 Pump Well**
NTC Job #13850-2013

Mr. Dunn:

*Northeast Test Consultants* has completed a Hazardous Materials Assessment of the Pump Well for Dry Dock #3 at the Portsmouth Naval Shipyard located on Seavey Island in Kittery, Maine.

## PURPOSE

The purpose of this assessment was to characterize current environmental conditions of the requested structure/area for the presence of Asbestos Containing Materials and Lead-Based Paint.

## PROCEDURES

On April 10, 2014, a representative of *Northeast Test Consultants* was on-site at the property to perform survey and inspection work.

No formal analytical testing for any other specific items or chemicals was requested nor part of the scope of services provided for these operations other than those parameters presented in this report.

Any conclusions contained herein are limited by the scope of work performed; no warranty, expressed or implied, is indicated as to any subsurface conditions not specifically noted within this report. All reasonable and customary assessment procedures and explorations for determination of the potential for multiple floor layering and possible hidden materials were performed during the course of this assessment activity, short of performing minor demolition.

587 Spring Street • Westbrook • Maine 04092 (207) 854-3939 FAX (207) 854-3658

## *Asbestos in Building Materials*

The asbestos materials assessment consisted of visual evaluation and sample collection of suspect asbestos materials encountered by accredited and certified ME DEP asbestos inspectors.

The collection of suspect asbestos containing building materials was performed in accordance with the *State of Maine Department of Environmental Protection's* Asbestos Management Regulations, Chapter 425, Section 6, Inspection Requirements.

*State of Maine Department of Environmental Protection's* Asbestos Management Regulations, Chapter 425, effective date 4-3-2011 require analysis of collected samples as follows:

**A.** Surfacing materials, thermal system insulation and cementitious materials shall be analyzed using the PLM–EPA 600/R-93/116 visual estimation method (1993).

**B.** Non-friable Organically Bound materials (NOB's), including but not limited to floor tiles, asphalt shingles, caulking, glazing, mastics, coatings, sealants, adhesives and glues shall be analyzed using PLM NOB–EPA 600/R-93/116 with gravimetric preparation method.

Point counting of any samples with asbestos content less than 10% was automatically performed.

Bulk sample groups were analyzed until a positive result was obtained or all samples in the group had been analyzed. The *State of Maine* DEP does not require any re-analysis of materials if the sample result is less than 1% by the above PLM Visual and/or PLM NOB methods.

Sampling was comprised of the collection of homogenous materials as follows:

Surfacing Materials -

A.) At least 3 bulk samples from each homogenous area and/or material that is 1000 square feet or less;

B.) At least 5 bulk samples from each homogenous area that is greater than 1000 square feet but less than or equal to 5000 square feet; or

C.) At least 7 bulk samples from each homogenous area that is greater than 5000 square feet.

Thermal System Insulation -

A.) 3 bulk samples from each homogenous area;

B.) 1 bulk sample from each homogenous area of patched thermal system insulation if the patched section is less than 6 linear or square feet;

C.) Samples sufficient to determine whether the material is ACM from each insulated mechanical system where cement is utilized on tees, elbows, or valves.

Miscellaneous Materials -

A.) 3 samples from each miscellaneous material;

B.) 1 sample if the amount of miscellaneous material is less than 6 square or linear feet.

## *Lead-Based Paint*

The lead-based paint assessment was comprised of the collection of representative bulk samples followed by off-site analysis utilizing a portable X-Ray Fluorescence Lead Paint Analyzer (XRF; RMD LPA-1) at Northeast Test Consultants' lab. Building components in the pump well were assessed.

This equipment is licensed with the Department of Human Services Radiation Control Program (#05605G) and operated in accordance with all applicable regulations and conditions of licensure.

The information compiled during this testing is not intended to be substituted for a comprehensive lead-based paint survey or to be used to express potential exposure to airborne lead. The testing provides information on the lead-based paint content and condition assessment for the surfaces tested during this inspection.

Inconclusive XRF analyses of samples were further verified by Total Lead Analysis utilizing sample preparation according to ASTM D3335-85A "Standard Method to Test for Low Concentrations of Lead in Paint by Atomic Absorption Spectrometry (AAS) and US EPA Method SW846-(3050B:7000B) "Standard Method to Test for Low Concentrations of Lead in Soils, Sludges, and Sediments by AAS.

## ASBESTOS INSPECTION & SAMPLING

A walkthrough was performed in all accessible areas of the DD #3 Pump Well during this inspection, and sampling was performed for all suspect asbestos containing materials as encountered while progressing through the various pump well areas.

This inspection was performed in accordance with all reasonable and customary assessment procedures and explorations for the determination of the potential layering and/or possible hidden materials during the course of this assessment activity, short of performing minor demolition to dismantle/deconstruct building components/systems.

Bulk samples of suspect materials that were collected during this sampling event consisted of the following:

*Ductwork Joint Sealants* (round & square ducts)
*Insulation Seam Sealants* (square ducts)

Sample groups of similar materials were analyzed until positive, if applicable.

The following number of samples were collected and analyzed during this assessment:

| Analysis Type | Collected | Analyzed |
|---|---|---|
| PLM-Visual | 0 | 0 |
| PLM-NOB | 9 | 9 |
| TEM | n/a | 0 |

***Limitations***

Any conclusions contained herein are limited by the scope of work performed; no warranty, expressed or implied, is indicated as to any subsurface conditions not specifically noted within this report.

***Explanation of Analysis Methods***

The collected samples were analyzed utilizing Polarized Light Microscopy (PLM) and PLM NOB–EPA 600/R-93/116 with Gravimetric Preparation Method.

PLM is a US EPA accepted screening method for asbestos in bulks. This analytical method readily identifies asbestos content quantitatively. However, it can fail in samples where asbestos fibers are very fine or obscured by a tightly binding matrix system.

PLM methods are compiled from standard techniques used in mineralogy and standard laboratory procedures used for asbestos bulk sample analysis. These techniques have been successfully applied to the analysis of US EPA Bulk Sample Analysis Quality Assurance Program since 1982.

Some of the bulk samples analyzed did require assessment by Point Counting techniques, as the asbestos amounts detected were less than 10% by volume. The Point Counting technique produces very accurate quantitative data when the material is homogeneous and has a uniform thickness. Point Counting is recommended by the US EPA to determine the amount of asbestos in bulk samples, and is also recommended by the Asbestos Hazard Emergency Response Act (AHERA) regulations.

*Refer to the attached analytical data sheets and marked drawings for materials sampled as part of this assessment action.*

## *Recommendations (Asbestos in Building Materials)*

**None required – no asbestos materials detected.**

## LEAD-BASED PAINT INSPECTION

Lead-based paint testing was performed by the collection of paint scrape samples

followed by off-site XRF analysis at NTC's lab by Brian Cohen, Industrial Hygienist and manufacturer trained XRF operator.

This XRF equipment is licensed with the Department of Human Services Radiation Control Program (#05605G) and operated in accordance with all applicable regulations and conditions of licensure.

The instrument satisfactorily underwent pre-and post-calibration utilizing the manufacturer's reference standard.

The information compiled during this testing is not intended to be substituted for a comprehensive HUD-type lead-based paint survey or to be used to express potential exposure to airborne lead. The testing provides information on the lead-based paint content and condition assessment for the surfaces tested during this inspection as they currently exist.

A general listing of painted components tested for the presence of lead are as follows:

*Walls*
*Ceilings*
*Railings*
*I-Beams*

A total of twelve (12) bulk samples were collected during this assessment.

**All twelve (12) of the collected samples had lead values less than 0.3 milligrams per square centimeter (<0.3 mg/cm$^2$) which represent paints with no lead content.**

**These samples were further evaluated for Total Lead content by paint color via Atomic Absorption Spectrometry (AAS) utilizing ASTM D3335-85A and US EPA Method SW 846-3050B/7000B.**

**Only one (1) sample had a resulting lead content as follows:**

| | | XRF Reading, mg/cm$^2$ | Total Lead, % |
|---|---|---|---|
| **L-4** | **Railings, Black paint (over green)** | <0.3 | **1.1** |

Each individual reading for the components tested (whether positive or negative) has been documented on the "Field Form" sheets. Analysis results are indicated in milligrams per square centimeter (mg/cm$^2$).

*Refer to the attached "Analytical Results for Lead Based Paint" and "Total Lead Results" data sheets and attached marked drawings for reference.*

### *Limitations*

In certain circumstances, leaded components may be covered by other building components, such as paneling/sheetrock, metal panels, or transite sheeting enclosing or covering another painted surface, etc. It should be understood that this lead determination process was comprised of the collection of scrape samples for current surfaces. The Owner can either assume that inaccessible components contain lead-based paints or have them tested when renovation work may disturb them.

### *Explanation of Analysis Methods*

The X-Ray Fluorescence Lead Paint Analyzer is a complete lead paint analysis system that quickly, accurately, and non-destructively measures the concentration of lead-based paint on surfaces or for collected bulk paint samples. X-Ray Fluorescence is a common technique utilizing gamma rays to bombard the surface, causing the atoms in the paint to emit characteristic X-Rays. These characteristic X-Rays are detected and analyzed to provide the concentration information.

The RMD LPA-1 has the ability to read concentrations of lead in paint up to 9.9 milligrams per square centimeter; if the content of lead in the paint is greater than 9.9, the reading for that component will be listed as >9.9 $mg/cm^2$. The minimum detection limit of this particular equipment is 0.3 milligrams per square centimeter.

Calibration of the equipment is required prior to the inspection/testing process, 4-hours into the inspection/testing process and at the completion of the inspection process. As indicated previously, the calibration readings during the course of the testing for the collected bulk paint samples were within the limits established by the manufacturer.

## *Overview of Lead in Painted Surfaces*

The objective of this inspection/determination was to determine the presence of lead-based paint for overall renovation impact and not each and every surface for the structure. The information compiled during this testing is not intended to be substituted for a comprehensive lead-based paint survey, or to be used to express potential exposure to airborne lead for the purposes of regulation compliance. All scraping, sanding, cutting, welding, grinding, or demolition of any painted surface should not be performed under dry conditions in which airborne dust can be generated.

Similarly, renovation/demolition activities that may impact lead-containing components are a concern with respect to the generation of airborne lead dust; therefore, safety measures such as the use of engineering controls are essential in order to protect human health and the environment.

Contractors performing renovation/demolition activities in which excessive amounts of lead dust may potentially be generated shall be trained in the hazards of lead-containing materials and the subsequent control of the impacted environment, removal, cleaning, packaging, and handling of these materials as well as the wearing of NIOSH approved respirators, use of

disposable clothing, and other requirements of the standard. All work operations shall be performed in accordance with the following:

*OSHA 29 CFR Part 1926.62, Lead Standard.*

---

***OSHA's Letter of Interpretation regarding the concentration of lead in paint which triggers the Lead-in-Construction Standard 29 CFR 1926.62:***

"The lead-in-construction standard was intended to apply to any detectable concentration of lead in paint, as even small concentrations of lead can result in unacceptable employee exposures depending upon the method of removal and other workplace conditions. Since these conditions can vary greatly, the lead-in-construction standard was written to require exposure monitoring or the use of historical or objective data to ensure that employee exposures do not exceed the action level. Historical data may be applied to all construction tasks involving lead. Objective data was intended to apply to all tasks other than those listed under paragraph 1926.62(d)(2) of the standard.

OSHA does not consider X-Ray fluorescence (XRF) to be an acceptable method of analysis. XRF analyzers are generally considered accurate when concentrations of lead in paint exceed 1 $mg/cm^2$. For the purposes of occupational health, these levels are considered substantial and may easily present an exposure hazard. Without having conducted monitoring, or without the benefit of historical or objective data, the employer has no assurance of the employee's exposure.

Other regulatory agencies, such as Housing and Urban Development, the Environmental Protection Agency, and the Consumer Products Safety Commission (CPSC) have designated levels of lead in paint, below which they consider the paint to be non-lead containing. The missions of these agencies differ from OSHA's, and for that reason, OSHA cannot recognize these levels as safe under workplace situations.

OSHA has recognized, however, that for certain workplace conditions, application of objective data to certain tasks listed in paragraph 926.62(d)(2)(i)(A) may be warranted (specifically, power tool cleaning with dust collection systems, manual demolition of structures, manual scraping and manual sanding). For these applications only, we have adopted the CPSC threshold under a very limited set of conditions.

Specifically, when a paint contains trace amounts of lead (e.g., 0.06% and below, as defined by the Consumer Products Safety Commission as non-lead containing, 16 CFR 1303), the employer may determine the concentration of lead in the air (i.e., employee exposure) by multiplying the total airborne concentration of dust times the percentage of lead in the paint. For example, if the concentration of total dust is 15 $mg/m^3$ and the concentration of lead in paint is 0.06%, the airborne

lead level will be (0.06%) x (15 $mg/m^3$) x (1000 μg/mg) = 9 $\mu g/m^3$.

Consequently, the airborne concentration of dust would have to be 50 $mg/m^3$ before the action level of 30 $\mu g/m^3$ would be reached. Arithmetically, this would read, (50 $mg/m^3$ total dust) x (0.06% lead) x (1000 μg/mg) = 30 $\mu g/m^3$ airborne lead.

OSHA wants to stress that this does not set 0.06% as a lower threshold for the concentration of lead in paint which would exempt the employer from the requirements of the standard. The employer must still follow all requirements of the standard and conduct an exposure assessment for the tasks involving lead. Additionally, we are not stating that the Consumer Products Safety Commission level is a "safe" concentration of lead in paint, since all tasks listed under 926.62(d)(2) frequently entail exposures above the action level, even at extremely low concentrations of lead. We are simply stating that the application of objective data may be applied to the above-specified tasks in paragraph 926.62(d)(2)(i)(A), under the conditions stated herein. As these are less aggressive dust-generating methods of removal, this type of objective data may reasonably be applied."

---

## *Recommendations (Lead Paint)*

**If significant dust is generated during demolition or any direct aggressive mechanical methods or flame torching of painted surfaces is conducted, then contractors may be at risk for exposure to airborne lead levels. It is not the content of lead present for the painted surfaces but the method of impact that would determine what level of personal protective equipment would be required by affected personnel. Without conducting personal breathing zone monitoring, or without the benefit of historical or objective exposure data, an employer has no assurance of the employee's potential exposure.**

**The painted components with lead values equal to or greater than 1.0 milligram per square centimeter ($\geq$ 1.0 $mg/cm^2$) and analyzed for Total Lead with results greater than 0.06 percent (>0.06%) do not require any special waste handling or disposal as long as the demolition debris is not recycled or brought to a facility that would burn it.**

**The lead content in the paint adhered to building materials is not anticipated to result in a TCLP Lead Value equal to or greater than 5 milligrams per Liter ($\geq$ 5 mg/L).**

**If free paint chips are produced and collected separately from any demolition debris where lead paint testing indicates >9.9 $mg/cm^2$, then these paint chips should be packaged and disposed of as lead containing waste as the loose paint debris material itself without the dilution effect of the substrate materials will in all probability result in TCLP values $\geq$ 5 mg/L, classifying it as an EPA hazardous waste stream material.**

Please review the attached analytical results for the collected bulk samples for asbestos, analytical data sheets for results of lead-based paint bulk samples collected, and marked drawings for all sampling parameters.

Should you have any questions please feel free to give me a call.

Sincerely,

John M. Bollard, RIHT
ME DEP DC, AA, AI, AM
Operations Manager

Attachments

*ASBESTOS BULK RESULTS*

Sample Date: 04/10/2014
NTC Job # 13850-2013

Client: Oak Point Associates
231 Main Street, P.O. Box 1259
Biddeford, Maine 04005

Location: Portsmouth Naval Shipyard
Dry Dock #3 - Pump Well
Kittery, Maine

This report only refers to the sample analyzed and is not necessarily denotative of the quality or condition of overtly identical or similar products. This report is submitted and approved for the use of the client to whom it is addressed. It is not to whole, in any advertising without prior written authorization from NTC. Sample types, locations and collection properties are based upon the information provided by the persons submitting them and, unless collected by NTC personnel, we explicitly disclaim knowledge and liability for the accuracy of this data. All rights reserved by Northeast Test Consultants, Westbrook, Maine. This analytical report is provided by NTC and does not indicate endorsement by NVLAP or any agency of the U.S. Government.

| Sample # | Lab # | Location / Description | % & Type of Asbestos | % & Type Fibrous Material | % Non-Fibrous Material |
|---|---|---|---|---|---|
| B-1 | B- 4100004 | Operating Floor Level, Circular Duct Work, **Sealant**, Gray | None Detected | None Detected | 22.2% |
| B-2 | B- 4100005 | Operating Floor Level, Circular Duct Work, **Sealant**, Gray | None Detected | None Detected | 21.6% |
| B-3 | B- 4100006 | Operating Floor Level, Circular Duct Work, **Sealant**, Gray | None Detected | None Detected | 21.6% |
| B-4 | B- 4100007 | Pump Floor Level, Square Fiberglass Lined Duct, **Duct Sealant**, Gray | None Detected | None Detected | 21.4% |
| B-5 | B- 4100008 | Pump Floor Level, Square Fiberglass Lined Duct, **Duct Sealant**, Gray | None Detected | None Detected | 31.9% |
| B-6 | B- 4100009 | Pump Floor Level, Square Fiberglass Lined Duct, **Duct Sealant**, Gray | None Detected | None Detected | 28.6% |
| B-7 | B- 4100010 | Pump Floor Level, Square Duct, **Sealant**, White | None Detected | None Detected | 30.5% |
| B-8 | B- 4100011 | Pump Floor Level, Square Duct, **Sealant**, White | None Detected | 3.3% Fibrous Glass | 29.9% |
| B-9 | B- 4100012 | Pump Floor Level, Square Duct, **Sealant**, White | None Detected | 2.0% Fibrous Glass | 17.6% |

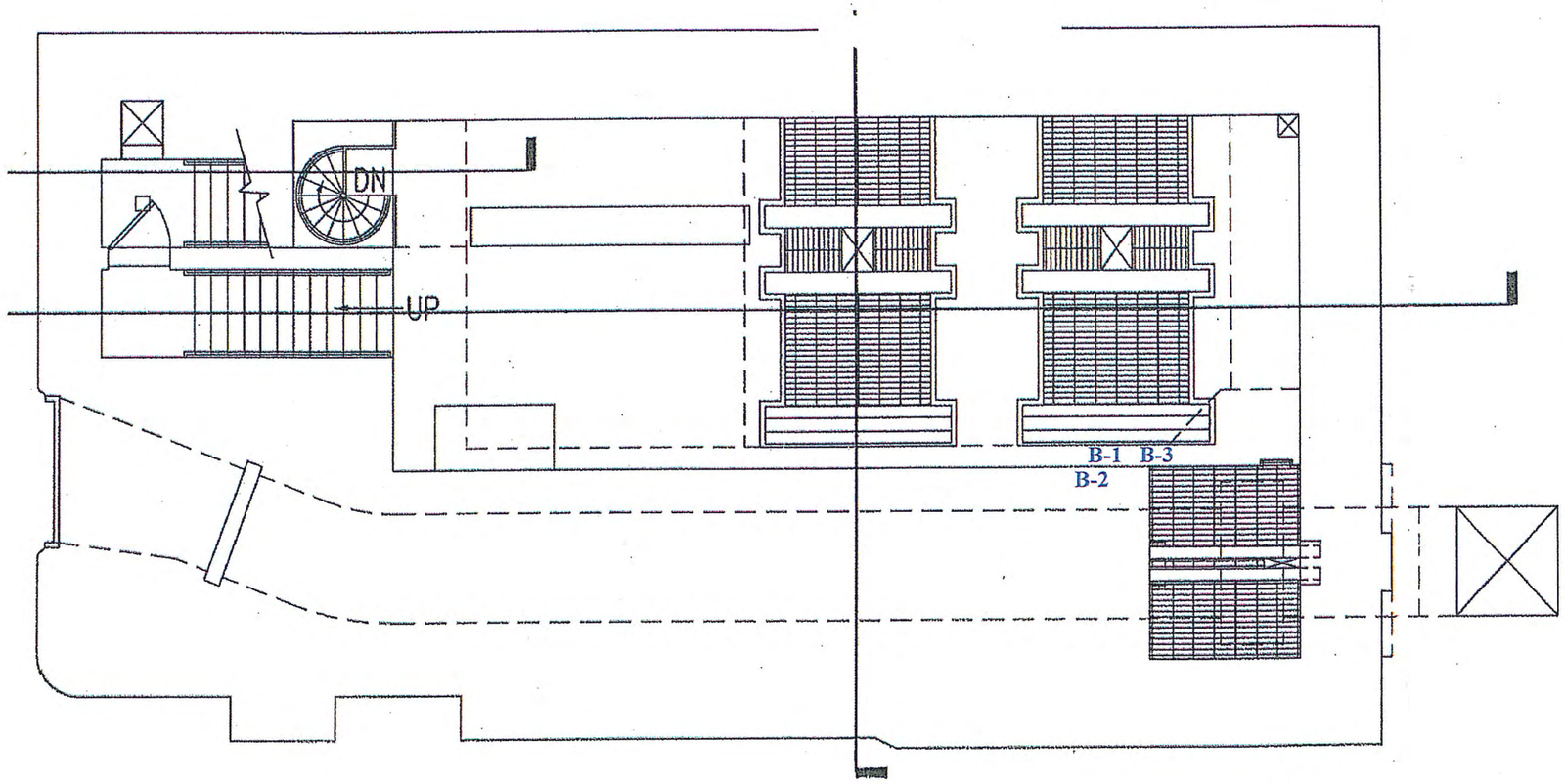
Lab:IATL(NVLAP# 101165-0)Analysis Meth:PLM-EPA600/R-93/116 and/or PLM NOB-EPA600/R-93/116w/Gravimetric Prep

Sampled by: B. Cohen
Approved by: Stephen R. Broadhead
Initial

# ASBESTOS MATERIALS SURVEY

## PORTSMOUTH NAVAL SHIPYARD

## DRY DOCK #3 PUMP WELL




PLAN - OPERATING FLOOR ELEV 89.50'±

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

PLAN NORTH

**KEY:**

B-# BULK SAMPLES POSITIVE for ASBESTOS

B-# BULK SAMPLES NEGATIVE for ASBESTOS

NORTHEAST TEST CONSULTANTS

NTC JOB #13850-2013

DRAWING DATE: 4-21-2014

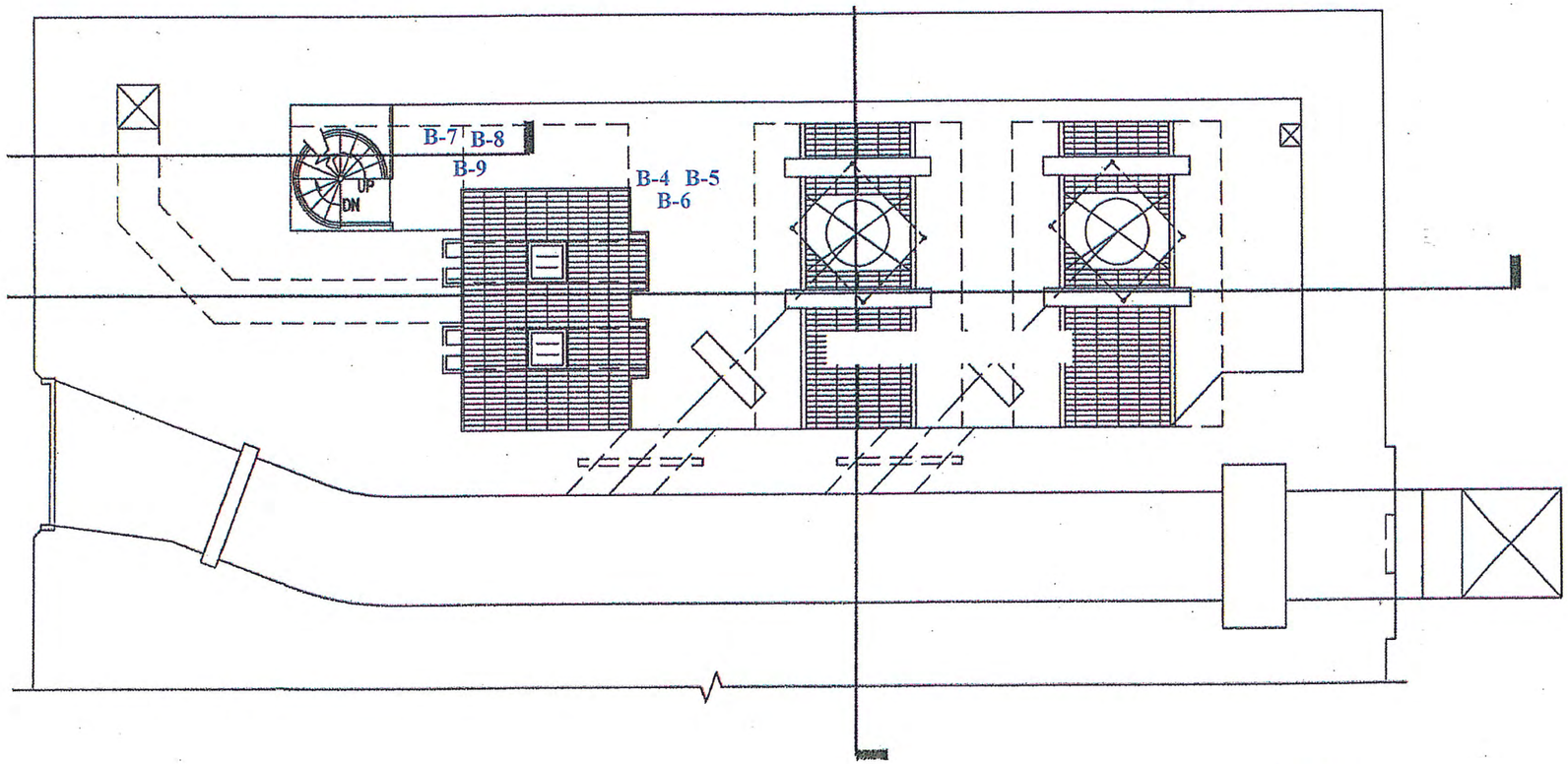
BFC

DRAWING NOT TO SCALE

# ASBESTOS MATERIALS SURVEY

## PORTSMOUTH NAVAL SHIPYARD

## DRY DOCK #3 PUMP WELL




PLAN - PUMP FLOOR ELEV 77.00'±

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

PLAN NORTH

**KEY:**

B-# BULK SAMPLES POSITIVE for ASBESTOS

B-# BULK SAMPLES NEGATIVE for ASBESTOS

NORTHEAST TEST CONSULTANTS

NTC JOB #13850-2013

DRAWING DATE: 4-21-2014

BFC

DRAWING NOT TO SCALE

**Client:** Oak Point Associates
231 Main Street
Biddeford, Maine

DATE: 2/26/2014
NTC JOB# 13850-2013
PAGE: 1

# ANALYTICAL RESULTS FOR LEAD BASED PAINT

**SITE LOCATION :** **Portsmouth Naval Shipyard, Dry Dock #3, Pump Well**

RESIDENTIAL: ☐ COMMERCIAL: ☒ UNKNOWN: ☐

| FIELD ID # | SAMPLE LOCATION DESCRIPTION | COLOR | CONDITION | # OF READINGS | RESULTS MG/CM$^2$ |
|---|---|---|---|---|---|
| L-1 | Operating Floor Level, South Wall | White | Good | 3 | <0.3 |
| L-2 | Operating Floor Level, North Wall | White | Good | 3 | <0.3 |
| L-3 | Operating Floor Level, Floor | Gray | Good | 3 | <0.3 |
| L-4 | Operating Floor Level, Stair Railing | Black over Green | Good | 3 | <0.3 |
| L-5 | Pump Floor Level, North Wall | White | Good | 3 | <0.3 |
| L-6 | Pump Floor Level, Floor | Gray | Good | 3 | <0.3 |
| L-7 | Pump Floor Level, Ceiling | White | Good | 3 | <0.3 |
| L-8 | Sump Floor Level, Railings | Yellow | Good | 3 | <0.3 |
| L-9 | Sump Floor Level, North Wall | White | Good | 3 | <0.3 |
| L-10 | Sump Floor Level, Ceiling | White | Good | 3 | <0.3 |
| L-11 | Sump Floor Level, Platform I Beam | Gray | Good | 3 | <0.3 |
| L-12 | Sump Floor Level, Stair Railings | Black | Good | 3 | <0.3 |

Pre-Use Calibration Reading: 1.0 mg/cm$^2$
Post-Use Calibration Reading: 1.0 mg/cm$^2$

**Industrial Hygienist:** Brian Cohen

**Key:**
= Lead Containing Material

DISCLAIMER: This report only refers to the sample(s) analyzed and is not necessarily denotative of the quality or condition of overtly identical and/or similar products. This report is submitted and approved for the private use of the Client to whom it is addressed. Sample types, locations, condition properties are solely based upon the information provided by the person(s) submitting them and, unless collected by NTC personnel, NTC explicitly disclaims knowledge and liability for the accuracy of the data. This report format is not to be used, in part or in whole, without the prior written consent from NTC. All rights reserved by Northeast Test Consultants, 587 Spring Street, Westbrook, Maine 04092.

**CLIENT:** Oak Point Associates
231 Main Street
Biddeford, Maine

**NTC JOB #:** 13850-2013
**DATE:** 4/10/2014

# TOTAL LEAD SAMPLE RESULTS

## Portsmouth Naval Shipyard, Dry Dock #3, Pump Well

*Analytical Method: ASTM D3335-85A EPA SW846 3050B/7000B*
*by Atomic Absorption Spectrophotometry (AAS)*

| SAMPLE # | LAB ID # | SAMPLE DESCRIPTION | COLOR | TOTAL LEAD BY WEIGHT % |
|---|---|---|---|---|
| L-1 | *IHB4100002* | Operating Floor Level, South Wall | White | ***<0.0075*** |
| L-3 | *IHB4100003* | Operating Floor Level, Floor | Gray | ***<0.007*** |
| L-4 | *IHB4100004* | Operating Floor Level, Stair Railing | Black over Green | **1.10** |
| L-8 | *IHB4100005* | Sump Floor Level, Railings | Yellow | ***<0.0067*** |
| L-9 | *IHB4100006* | Sump Floor Level, North Wall | White | ***<0.0081*** |
| L-10 | *IHB4100007* | Sump Floor Level, Ceiling | White | ***<0.0063*** |
| L-11 | *IHB4100008* | Sump Floor Level, Platform I-Beam | Gray | ***<0.0075*** |

*Exceeds HUD/EPA Definition of Lead-Based Paint by AAS Analysis: 0.5% by weight*

*Exceeds Consumer Product Safety Commission Definition of Non-Lead-Based Paint by AAS Analysis: ≤ 0.06% by weight*

*#Matrix/substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks.*

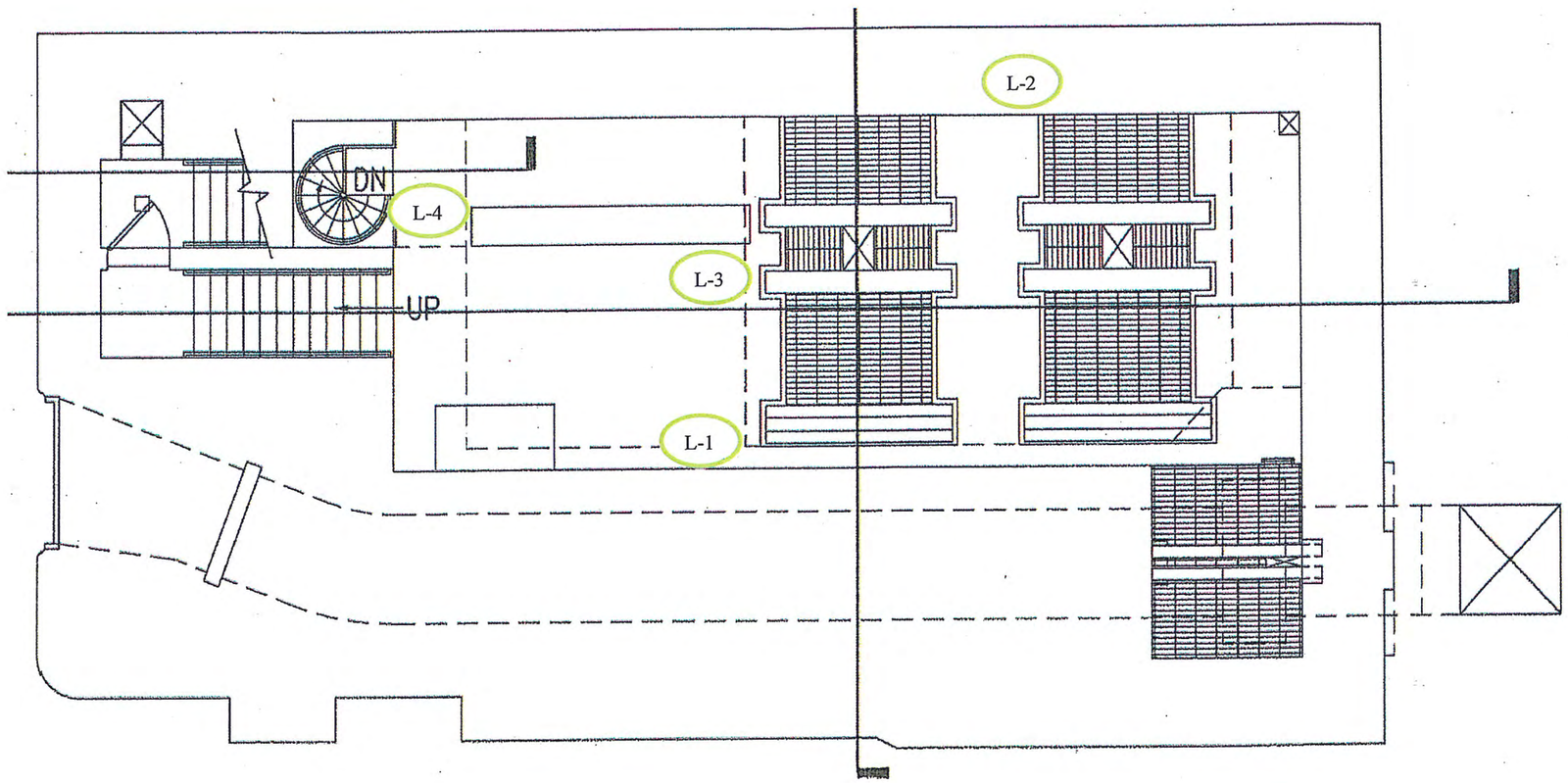
Analytical Laboratory: IATL

Sampled By: Brian Cohen

# LEAD-BASED PAINT ASSESSMENT SURVEY

## PORTSMOUTH NAVAL SHIPYARD

## DRY DOCK #3 PUMP WELL




PLAN - OPERATING FLOOR ELEV 89.50'±

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

PLAN NORTH

**KEY:**

L- BULK SAMPLES with XRF READINGS WITH LEAD < 1.0 mg/cm²

L- BULK SAMPLES with XRF READINGS > 1.0 mg/cm² INDICATING PRESENCE OF LEAD CONTENT

NORTHEAST TEST CONSULTANTS

NTC JOB #13850-2013

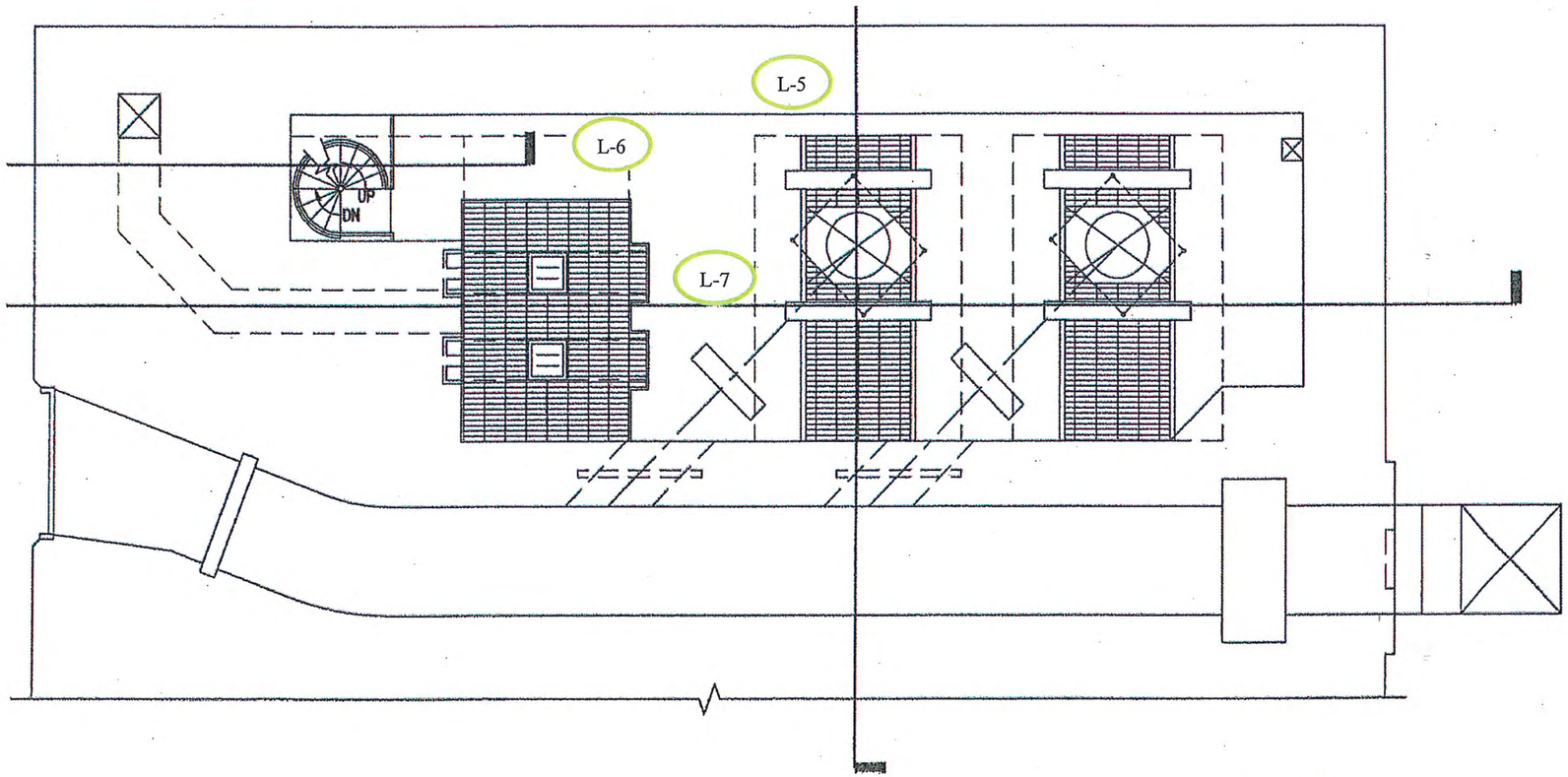
DRAWING DATE: 4-21-2014

BFC

DRAWING NOT TO SCALE

# LEAD-BASED PAINT ASSESSMENT SURVEY

## PORTSMOUTH NAVAL SHIPYARD
## DRY DOCK #3 PUMP WELL




PLAN - PUMP FLOOR ELEV 77.00'±

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

PLAN NORTH

**KEY:**

L- BULK SAMPLES with XRF READINGS WITH LEAD < 1.0 mg/cm²

L- BULK SAMPLES with XRF READINGS > 1.0 mg/cm² INDICATING PRESENCE OF LEAD CONTENT

NORTHEAST TEST CONSULTANTS

NTC JOB #13850-2013

DRAWING DATE: 4-21-2014

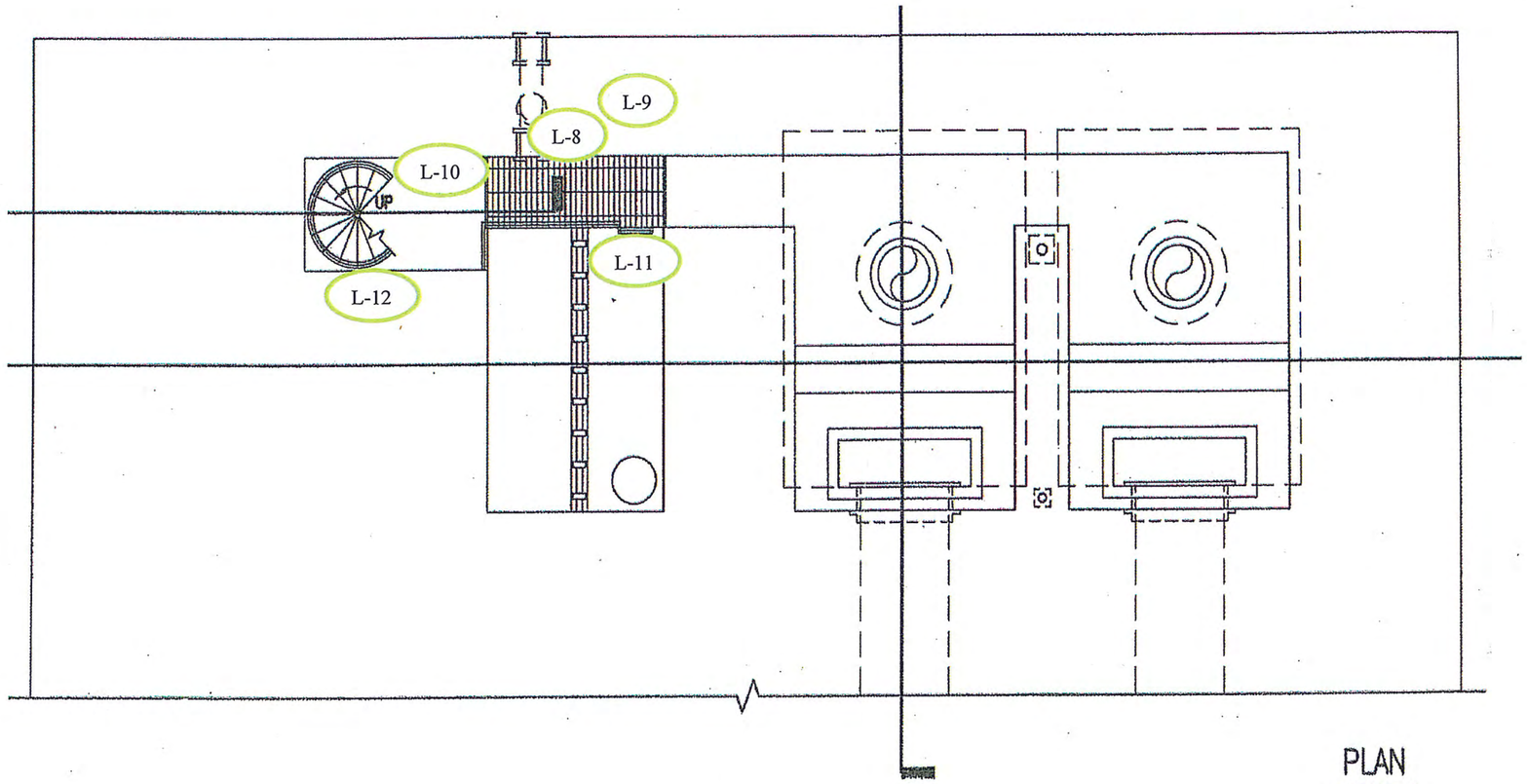
BFC

DRAWING NOT TO SCALE

# LEAD-BASED PAINT ASSESSMENT SURVEY

## PORTSMOUTH NAVAL SHIPYARD

## DRY DOCK #3 PUMP WELL




PLAN NORTH

PLAN - SUMP FLOOR ELEV 60.00'±

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

**KEY:**

L- BULK SAMPLES with XRF READINGS WITH LEAD < 1.0 mg/cm²

L- BULK SAMPLES with XRF READINGS > 1.0 mg/cm² INDICATING PRESENCE OF LEAD CONTENT

NORTHEAST TEST CONSULTANTS

NTC JOB #13850-2013

DRAWING DATE: 4-21-2014

BFC

DRAWING NOT TO SCALE

# SECTION 02 84 16

# HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
**04/06**

## PART 1 GENERAL

**Transport And Disposal Of PCB And Mercury-Containing Materials To A Licensed Disposal Site Will Be By Separate Contract. Contractor Shall Ensure All PCB And Mercury-Containing Materials Are Properly Packaged and Labeled Prior To Placement Into Government-Furnished Containers.**

### 1.1 REFERENCES

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

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

| | |
|---|---|
| 29 CFR 1910.1000 | Air Contaminants |
| 40 CFR 260 | Hazardous Waste Management System: General |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 262 | Standards Applicable to Generators of Hazardous Waste |
| 40 CFR 263 | Standards Applicable to Transporters of Hazardous Waste |
| 40 CFR 264 | Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 265 | Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 273 | Standards For Universal Waste Management |
| 40 CFR 761 | Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions |
| 49 CFR 178 | Specifications for Packagings |

### 1.2 REQUIREMENTS

Removal and placement into Government-furnished containers of PCB containing lighting ballasts and associated mercury-containing lamps. Contractor may encounter leaking PCB ballasts.

## 1.3 DEFINITIONS

### 1.3.1 Certified Industrial Hygienist (CIH)

A industrial hygienist hired by the Contractor shall be certified by the American Board of Industrial Hygiene.

### 1.3.2 Leak

Leak or leaking means any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

### 1.3.3 Lamps

Lamp, also referred to as "universal waste lamp", is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

### 1.3.4 Polychlorinated Biphenyls (PCBs)

PCBs as used in this specification shall mean the same as PCBs, PCB containing lighting ballast, and PCB container, as defined in 40 CFR 761, Section 3, Definitions.

### 1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

### 1.3.6 Universal Waste

Universal Waste means any of the following hazardous wastes that are managed under the universal waste requirements 40 CFR 273:

(1) Batteries as described in Sec. 273.2 of this chapter;
(2) Pesticides as described in Sec. 273.3 of this chapter;
(3) Thermostats as described in Sec. 273.4 of this chapter; and
(4) Lamps as described in Sec. 273.5 of this chapter.

## 1.4 QUALITY ASSURANCE

### 1.4.1 Regulatory Requirements

Perform PCB related work in accordance with 40 CFR 761. Perform mercury-containing lamps storage in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, and 40 CFR 273.

### 1.4.2 Training

Certified industrial hygienist (CIH) shall instruct and certify the training of all persons involved in the removal of PCB containing lighting ballasts and mercury-containing lamps. The instruction shall include: The

dangers of PCB and mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations. The CIH shall review and approve the PCB and Mercury-Containing Lamp Removal Work Plans.

1.4.3 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of 29 CFR 1910.1000, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 265, 40 CFR 273 and of the Contractor removal work plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

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

SD-07 Certificates

Qualifications of CIH; G

Training Certification; G

PCB and Lamp Removal Work Plan; G

SD-11 Closeout Submittals

Certificate of Decontamination

1.6 ENVIRONMENTAL REQUIREMENTS

Use special clothing:

a. Disposable gloves (polyethylene)

b. Eye protection

c. PPE as required by CIH

1.7 SCHEDULING

Notify the Contracting Officer 20 days prior to the start of PCB and mercury-containing lamp removal work.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of CIH

Submit the name, address, and telephone number of the Industrial Hygienist selected to perform the duties in paragraph entitled "Certified Industrial Hygienist." Submit training certification that the Industrial Hygienist is certified, including certification number and date of certification or re certification.

1.8.2 PCB and Lamp Removal Work Plan

Submit a job-specific plan within 20 calendar days after award of contract of the work procedures to be used in the removal, packaging, and storage

of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan: Requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking and restroom procedures. The plan shall be approved and signed by the Certified Industrial Hygienist. Obtain approval of the plan by the Contracting Officer prior to the start of PCB and/or lamp removal work.

## PART 2 PRODUCTS

Not used.

## PART 3 EXECUTION

### 3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lamps in accordance with local, State, or Federal regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps.

#### 3.1.1 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262, 40 CFR 263, and the applicable requirements of this section including, but not limited to:

a. Obtaining suitable PCB and mercury-containing lamp storage sites.

b. Notifying Contracting Officer prior to commencing the operation.

c. Reporting leaks and spills to the Contracting Officer.

d. Cleaning up spills.

e. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.

f. Maintaining inspection, inventory and spill records.

### 3.2 PCB SPILL CLEANUP REQUIREMENTS

#### 3.2.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills.

#### 3.2.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

#### 3.2.3 PCB Spill Cleanup

40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible,

but no later than 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

### 3.2.4 Records and Certification

Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide test results of cleanup and certificate of decontamination.

## 3.3 REMOVAL

### 3.3.1 Ballasts

As ballasts are removed from the lighting fixtures, inspect label on ballast. Ballasts without a "No PCB" label shall be assumed to contain PCBs and containerized and disposed of as required under paragraph STORAGE FOR DISPOSAL.

### 3.3.2 Lighting Lamps

Remove lighting tubes/lamps from the lighting fixture and carefully place (unbroken) into appropriate Government-furnished containers. In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as universal waste as specified herein.

## 3.4 STORAGE FOR DISPOSAL

### 3.4.1 Storage Containers for PCBs

49 CFR 178. Store PCB in containers furnished by the Government.

### 3.4.2 Storage Containers for lamps

Store mercury containing lamps in containers furnished by the Government. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

### 3.4.3 Labeling of Waste Containers

Label with the following:

a. Date the item was placed in storage and the name of the cognizant activity/building.

b. "Caution Contains PCB," conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.

c. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

## 3.5 DISPOSAL

**Transport And Disposal Of PCB And Mercury-Containing Materials To A Licensed Disposal Site Will Be By Separate Contract. Contractor Shall Ensure All PCB And Mercury-Containing Materials Are Properly Packaged and Labeled Prior To Transport Placement Into Government-Furnished Containers.**

-- End of Section --

# SECTION 03 01 32

# CONCRETE REHABILITATION
**11/09**

## PART 1 GENERAL

Work under this section covers interior and exterior concrete repairs, and joint repair as shown on the drawings and specified herein.

### 1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

| | |
|---|---|
| AASHTO T 277 | (2007) Standard Method of Test for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration |

ACI INTERNATIONAL (ACI)

| | |
|---|---|
| ACI 117 | (2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary |
| ACI 211.1 | (1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete |
| ACI 301 | (2010; Errata 2011) Specifications for Structural Concrete |
| ACI 304.2R | (1996; R 2008) Placing Concrete by Pumping Methods |
| ACI 305R | (2010) Guide to Hot Weather Concreting |
| ACI 306.1 | (1990; R 2002) Standard Specification for Cold Weather Concreting |
| ACI 308R | (2001; R 2008) Guide to Curing Concrete |
| ACI 311.4R | (2005) Guide for Concrete Inspection |
| ACI 318 | (2011; Errata 1 2011; Errata 2 2012; Errata 3-4 2013) Building Code Requirements for Structural Concrete and Commentary |
| ACI 546R | (2004) Concrete Repair Guide |
| ACI 546.3R | (2006) Guide for the Selection of Materials for the Repair of Concrete |

| | |
|---|---|
| ACI 347 | (2004; Errata 2008; Errata 2012) Guide to Formwork for Concrete |
| ACI 364.3R | (2009) Guide for Cementitious Repair Material Data Sheet |
| ACI E 706 | (2004) Surface Repair Using form-and-pump Techniques |

AMERICAN WELDING SOCIETY (AWS)

| | |
|---|---|
| AWS D1.1/D1.1M | (2010; Errata 2011) Structural Welding Code - Steel |
| AWS D1.4/D1.4M | (2011) Structural Welding Code - Reinforcing Steel |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A706/A706M | (2014) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement |
| ASTM B418 | (2012) Standard Specification for Cast and Wrought Galvanic Zinc Anodes |
| ASTM C1077 | (2014) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation |
| ASTM C109/C109M | (2013) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) |
| ASTM C117 | (2013) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing |
| ASTM C1202 | (2012) Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration |
| ASTM C136 | (2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates |
| ASTM C143/C143M | (2012) Standard Test Method for Slump of Hydraulic-Cement Concrete |
| ASTM C157/C157M | (2008; E 2014) Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete |
| ASTM C1581/C1581M | (2009a) Standard Test Method for Determining Age at Cracking and Induced Tensile Stress Characteristics of Mortar and Concrete under Restrained Shrinkage |

| | |
|---|---|
| ASTM C1583/C1583M | (2004) Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method) |
| ASTM C172 | (2010) Standard Practice for Sampling Freshly Mixed Concrete |
| ASTM C231/C231M | (2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method |
| ASTM C31/C31M | (2012) Standard Practice for Making and Curing Concrete Test Specimens in the Field |
| ASTM C39/C39M | (2014a) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens |
| ASTM C496/C496M | (2011) Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens |
| ASTM C882/C882M | (2013a) Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear |
| ASTM D75/D75M | (2014) Standard Practice for Sampling Aggregates |

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

| | |
|---|---|
| ICRI 210.3-2004 | (2004) Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials (formerly No. 03739) |
| ICRI 310.1R-2008 | (2008)Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730) |
| ICRI 320.2R-2009 | (2009) Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| COE CRD-C 400 | (1963) Requirements for Water for Use in Mixing or Curing Concrete |
| EM 385-1-1 | (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual |

## 1.2 DEFINITIONS

The concrete and concrete repair terminology and definitions used are provided by "ACI Concrete Terminology" and ICRI "Concrete Repair

Terminology" unless otherwise defined in the specifications.

1.2.1 Concrete

A composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregate, usually a combination of fine aggregate and coarse aggregate; in Portland cement concrete, the binder is a mixture of Portland cement and water, with or without admixtures.

1.2.2 Pre-Packed Material

A composite material that consists of a mixture of cement paste, and fine aggregate, with or without admixtures.

1.2.3 Cement-Based Material

A material consisting of portland cement and/or other Cementitious materials as a binder and aggregate. As used in this specification, cement-based materials include materials with polymer modifiers.

1.2.4 Embedded Galvanic Anode

A zinc material used to cathodically protect adjacent reinforcing steel from corrosion typically embedded in low restivity cementious matrix.

1.2.5 Non-Structural Cracks and Joints

Cracks or joints that do not affect the load-carrying capacity of the structure.

1.3 GENERAL REPAIR REQUIREMENTS

The following requirements shall be met:

a. The achievement of the specified requirements, characteristics, and properties of repair materials and systems and the composite repair system regarding the fulfillment of their purpose to prolong the useful service life of the structure.

b. The achievement of the compatibility of the existing concrete and reinforcement with the repair and protection materials and systems and compatibility between different repair and protection products, including avoiding the risk of creating conditions which may cause acceleration of corrosion.

c. The achievement of the required condition of the substrate regarding cleanliness, roughness, cracking, tensile and compressive strength, chlorides and other aggressive agents, depth of carbonation, moisture content, and temperature.

d. The achievement of the required repair application conditions regarding ambient temperature, humidity, wind force, and precipitation and any temporary protection when needed.

1.4 REPAIR STRUCTURAL FUNCTION

Repairs to reinforced concrete structures are required to perform different functions. In some cases replacement of deteriorated or damaged

concrete to provide an acceptable appearance may be all that is required. This type of repair is considered a protective repair, with the main objective being to protect reinforcement from corrosion in order to slow down the deterioration processes. Stress-carrying function is not a primary consideration, and the concrete repairs and joint repairs can be described as non-structural.

## 1.5 CONCRETE REPAIR MATERIAL PROPERTY REQUIREMENTS

All repair materials shall be in accordance with applicable provisions of ACI 546.3R, ICRI Guideline No. ICRI 320.2R-2009 and conform to the following requirements:

The most important characteristics governing the selection of repair materials for this project is the repair materials permeability, compatibility with the existing substrate, and sensitivity to cracking caused by restrained volume changes. The critical material properties that affect its resistance to cracking include splitting tensile strength, and drying shrinkage.

All selected concrete shall match in color to the existing surrounding concrete.

### 1.5.1 Pre-Packaged Material

Pre-packaged material shall satisfy the following property criteria:

#### 1.5.1.1 Form and Pump Material

| Property | Test Method | Criteria |
|---|---|---|
| Splitting Tensile Strength | ASTM C496/C496M | 300 psi (minimum) @ 28 Days |
| Drying Shrinkage | ASTM C157/C157M modified by ACI 364.3R | 0.05%(maximum) @ 28 Days |
| Restrained shrinkage cracking | ASTM C1581/C1581M | No cracks within 14 days |
| Chloride Ion Penetration | ASTM C1202 or AASHTO T 277 | 1,500 coulombs (maximum) @ 28 Days |
| Bond Strength | ASTM C882/C882M | 2,000 psi (minimum) @ 28 Days |
| Compressive Strength | ASTM C39/C39M | 7,000 psi +/- 15% @ 28 Days |

1.5.1.2 Hand Troweling Material

| Property | Test Method | Criteria |
|---|---|---|
| Splitting Tensile Strength | ASTM C496/C496M | 300 psi (minimum) @ 28 Days |
| Drying Shrinkage | ASTM C157/C157M modified by ACI 364.3R | 0.05% (maximum) @ 28 Days |
| Restrained shrinkage cracking | ASTM C1581/C1581M | No cracks within 14 days |
| Chloride Ion Penetration | ASTM C1202 or AASHTO T 277 | 1,500 coulombs (maximum) @ 28 Days |
| Bond Strength | ASTM C882/C882M | 2,000 psi (minimum) @ 28 Days |
| Compressive Strength | ASTM C109/C109M | 7,000 psi +/- 15% @ 28 Days |

1.5.1.3 Form and Pour Material

| Property | Test method | Criteria |
|---|---|---|
| Splitting Tensile Strength | ASTM C 496/C 496M | 300 psi (minimum) @ 28 Days |
| Dry Shrinkage | ASTM C 157/C 157M modified by ACI 364.3R | 0.05% (maximum) @ 28 Days |
| Restrained shrinkage cracking | ASTM C 1581/C 1581M | No cracks within 14 Days |
| Chloride Ion Penetration | ASTM C 1203 or AASHTO T 277 | 1,500 coulombs (maximum) @ 28 Days |
| Bond Strength | ASTM C882/C882M | 2,000 psi (minimum) @ 28 Days |
| Compressive Strength | ASTM C 39/C 39M | 7,000 psi +/- 15% @ 28 Days |

1.5.2 Embedded Galvanic Anodes

Embedded galvanic anodes shall meet the intended service life of the repair and contain a 100 gram zinc core, factory encased in an activated cementitious mortar in compliance with ASTM B418 cast around integral bright steel tie wires for tying to the reinforcing steel. Anodes shall additionally be embedded in a minimum 1/2 inch of a low resistance embedding mortar with a resistivity equal to or less than 15,000 ohm-cm when placed in repair material with a resistivity greater than 15,000 ohm-cm

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control

approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Repair Plan; G

Contractor Qualifications
Worker Qualifications
Testing Technicians; G
Testing Agencies

Submit statements that the concrete testing technicians and agencies meet the specified requirements.

Licensed Professional Engineer (PE) Qualifications; G
Field Survey Results; G
Letter of Acceptance of Government's Defect Quantities; G
Procedures to Repair Defective Work; G
CP Specialist Qualifications; G

SD-02 Shop Drawings

Formwork; G
Anode Placement Details; G
Interior Containment Drawings and Procedures; G

SD-03 Product Data

Reinforcing Steel; G
Pre-Packaged Material; G
Admixtures; G
Injection Grout; G
Galvanic Anodes

SD-05 Design Data

Repair material mixture proportioning; G
Trial Batch; G

SD-06 Test Reports

Pre-Packaged Material; G
Aggregates; G
Admixtures; G
Cement; G
Water; G
Pull-off bond Test; G

SD-07 Certificates

Form Removal Schedule; G
Placement and Compaction; G
QC Inspection Checklist; G

Manufacturer's certifications shall be submitted with test results for proposed materials. Certificates shall certify compliance with the appropriate specification referenced herein. Do not place materials without prior approval from the Contracting

Officer.

SD-08 Manufacturer's Instructions

Injection Grout
Pre-Packaged Material; G
Embedded Galvanic Anodes; G
Admixtures; G

Submit manufacturer's written surface preparation, mixing, application and curing instructions for each type of material.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for potentially hazardous materials.

## 1.7 QUALITY ASSURANCE

### 1.7.1 Qualifications

Submit Contractor qualifications and worker qualifications for approval in accordance with paragraph entitled "SUBMITTALS". The submittals shall, where applicable, identify individuals who will be working on this contract and their relevant experience. Do not make changes in approved personnel without prior approval of the Contracting Officer.

#### 1.7.1.1 Contractor Qualifications

The Contractor performing the repair work shall have been involved in a minimum of three concrete repair projects similar in size and scope to this project within the last five years.

#### 1.7.1.2 Worker Qualifications

Each worker engaged in the use of specialized removal or application equipment, including saw operators, form-and-pump, and injection process shall have satisfactorily completed an instruction program in the operation of the equipment. Each worker engaged in the operation of specialized equipment for the contract work shall have a minimum of three years of experience in the operation of the equipment.

#### 1.7.1.3 Field Testing Technicians and Agency

The individuals who sample and test concrete, as required in this specification, shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

Testing agencies that perform testing service on repair materials shall meet the requirements of ASTM C1077 and/or ACI 311.4R.

The QC inspector, inspecting repair work, shall be a licensed Professional Engineer (PE) qualified in the areas of work being performed and shall meet the requirements for Quality Control Manager outlined in Section 03 31 29 MARINE CONCRETE.

1.7.2 Regulatory Requirements

Perform all work in accordance with Section 01 57 19.00 22 TEMPORARY ENVIRONMENTAL CONTROLS - PORTSMOUTH NAVAL SHIPYARD (PWD ME) and applicable Federal, State and local safety, health and environmental requirements, and EM 385-1-1. The Contractor is responsible for obtaining all permits required by Federal, State and local agencies for the performance of the work.

1.7.3 Pre-Construction Conference

Before starting the repair project, the Contracting Officer or authorized representative shall meet the Contractor's Project Manager and Project Superintendent at the pre-construction conference. At this meeting, the Contractor shall present a work schedule to determine its acceptability to the Government and determine if there are any conflicts with Government daily operations. All scheduled conflicts shall be resolved to the satisfaction of the Government.

All aspects of field demonstrations, application procedures, repair materials, and corrosion protection employed shall be discussed to ensure that the Contractors' personnel understand all aspects of the repair project. The conference shall also include competent technical representatives of repair materials and corrosion protection systems manufacturers.

1.7.4 Drawings

1.7.4.1 Interior Containment Drawings and Procedures

Provide interior containment drawings and procedures. All debris and water shall be contained to the immediate work area. Open grating is present on all levels of the pump well.

1.7.4.2 Formwork

ACI 347. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components stamped by a licensed professional engineer. Indicate placement schedule, construction, and location and method of forming control joints. Include locations of inserts, pipework, conduit, sleeves, and other embedded items. Furnish drawings and descriptions of shoring and reshoring methods as required for horizontal concrete members.

1.7.4.3 Form Removal Schedule

Submit schedule for form removal indicating element and minimum length of time for form removal. Submit technical literature of forming material or liner, form release agent, form ties, and gasketing to prevent leakage at form and construction joints. Provide a full description of materials and methods to be used to patch form-tie holes.

1.7.5 Repair Material Mixture Proportioning

Submit, at least 45 days before work commences, a repair material mixture proportioning for each repair mix. Test reports and test results shall accompany the mixture proportions. Identify the proposed source of the materials and state the proportions of each constituent. When determining the mixture design, use samples of materials to be used on the job.

a. Trial batch: Trial batches and testing requirements for various repair materials specified shall be the responsibility of the material manufacturer and Contractor. The pre-packaged material manufacturers representative shall be on-site for all trial batch operations. The laboratory performing the tests shall be on site and shall conform to ASTM C1077. Samples of aggregates shall be obtained in accordance with the requirements of ASTM D75/D75M. Samples of materials other than aggregate shall be representative of those proposed for the project and shall be accompanied by the manufacturer's test reports indicating compliance with applicable specified requirements. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, which will produce a range of strength encompassing those required for the work.

b. Supporting criteria: Include in the submittal the following data for each trial batch:

(1) Proportions by weight

(2) Unit weights and specific gravities of constituents

(3) Batch weights

(4) Compressive strengths in accordance with the following:

| Material | Specimen Size | Test |
|---|---|---|
| Concrete | 6 by 12 inch cylinders | ASTM C39/C39M |
| Mortar | 2 inch cube | ASTM C109/C109M |

(5) Curing time

(6) Working time

(7) Slump

(8) Air content

1.7.6 Test Reports

1.7.6.1 Pre-Packaged Material

Include the following:

a. Compressive Strength

b. Splitting Tensile Strength

c. Drying Shrinkage

d. Restrained Shrinkage Cracking

e. Chloride Ion Penetration

f. Bond Strength

g. Aggregates

h. Admixtures

i. Cement

1.7.6.2 Water

Submit test results.

1.7.7 Placement and Compaction

a. Submit technical literature for equipment and methods proposed for use in placing repair material. Include pumping or conveying equipment including type, size and material for pipe, valve characteristics, pressure gauge, and the maximum length and height concrete will be pumped. No adjustments shall be made to the mixture design to facilitate pumping.

b Submit technical literature for equipment and methods proposed for vibrating and compacting repair material. Submittal shall include technical literature describing the equipment including vibrator diameter, length, frequency, amplitude, centrifugal force, and manufacturer's description of the radius of influence under load. Where flat work is to be cast, provide similar information relative to the proposed compacting screed or other method to ensure dense placement

1.7.8 Repair Plan

Submit the proposed methods for constructing or repairing each type of concrete repair. The plan shall include, but shall not be limited to, procedures for removal of deteriorated material, surface preparation, testing of repair materials, placing of material, curing, and test patches. The plan shall also include repair materials to be used along with specific information on products and/or constituents, and requirements for handling, storage, etc., equipment to be used, surface preparation, and requirements for placement, finishing, curing and protection specific to the materials used. Repair plan shall contain a proposed schedule for repairs. Curing details shall include how wet cure will be achieved inside the pump well and how water will be collected. Submit the repair plan for approval 30 days after notice to proceed, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1.7.9 Field Demonstration

Field demonstrations shall be completed on each repair method to verify the surface preparation, formwork placement, repair material, and placement technique prior to production repair work. Materials utilized in field demonstrations shall be tested in accordance with Paragraph entitled, "FIELD QUALITY CONTROL".

Successful completion of the field demonstration will be determined by the results of the test reports, bond pull off tests, and the inspection of the repair at 28 days to ensure that the requirements of the specifications have been met.

#### 1.7.9.1 Spall Repairs

Trial spall repairs shall be undertaken by the Contractor for each type of repair 30 days in advance of the repair project being scheduled to start to allow curing of repair materials and completion of the evaluation tests. Evaluation test results shall be in compliance with the requirements of this specification.

Trial spall repairs shall include a spall repair of 4 square feet or greater in utilizing form and pump material, as well as form and pour material.

Trial spall repairs shall be carried out using the same concrete removal and surface preparation methods, and the same materials and application methods as those to be used in the work. New trial repairs shall be carried out if any changes in materials and equipment occur during the course of the work.

The formwork shall be removed after a minimum of 7 days and the repairs shall be checked to ensure that the requirements of this specification have been met. Hammer sounding for debonding shall be conducted along with pull-off bond tests after 28 days. The tests shall be performed on completed sample repairs.

The direct pull-off bond test shall be conducted for the acceptance of each trial spall repair. Testing equipment, personnel, and procedures shall be submitted for review and approval prior to testing. A minimum of three individual pull-off tests shall be performed in each trial spall repair in accordance with the ICRI 210.3-2004. Bond strength shall not be less than 150 psi, unless failure is at least 1 inch into the existing concrete substrate. Areas damaged by pull-off bond tests shall be repaired with dry pack.

If the trial sample repair is not accepted by the Contracting Officer, the Contractor shall remove the repair, reapply and test the repair until the satisfactory results are obtained at no additional cost to the Government.

The quality and appearance of the sample repairs will be subject to the approval of the Contracting Officer, and if not judged satisfactory, additional sample repairs shall be performed and tested until approval is attained.

The surface preparation procedures, repair materials, and application techniques used in conducting the approved sample repairs shall be employed in the production repair project.

## 1.8 DELIVERY, STORAGE, AND HANDLING

### 1.8.1 Packing, Shipping, Handling, and Unloading

Inspect materials delivered to site for damage, unload and store with a minimum of handling. Deliver resin components and aggregate materials in original sealed containers where applicable.

### 1.8.2 Polymer Materials

Storage areas shall be in a windowless and weatherproof, but ventilated, insulated noncombustible building. Store polymer materials at temperatures between 40 degrees F to 85 degrees F, unless approved by

polymer manufacturer. Do not allow polymer materials to freeze.

### 1.8.3 Chemical Admixtures

Protect chemical admixtures and store and maintain between 40 degrees F to 90 degrees F, unless approved by the chemical admixture manufacture. Do not use any admixture that has been subjected to temperatures outside this range or in storage for longer than recommended by the manufacturer or that has been subjected to freezing in the work. Remove such materials from the site.

## 1.9 PROJECT/SITE CONDITIONS

### 1.9.1 Environmental Requirements

Do not place repair materials when weather conditions detrimentally affect the quality of the finished product. Do not place cement-based repair materials when the air temperature is below 40 degrees F in the shade. When air temperature is likely to exceed 90 degrees F, the cement-based repair material shall have a temperature not exceeding 90 degrees F when deposited, and the surface of such placed cement-based repair material shall be kept damp with a water fog until the approved curing medium is applied. Do not place polymer-modified repair materials when the air temperature is below 45 degrees F or above 85 degrees F unless approved by the polymer manufacturer. Placement restrictions for other materials shall be in accordance with the manufacturer's published literature. Halt work when weather conditions are potentially detrimental to the quality of repairing or bonding concrete. Follow manufacturer's instructions for weather conditions and temperature ranges.

### 1.9.2 Existing Conditions

#### 1.9.2.1 Embedded Materials

The contract drawings do not constitute a complete description of all metal parts and other materials that may be encountered, but represent the best information available to the Government. Other items, or different locations for items shown, may exist. Exercise care to avoid drilling through functional embedded items intended to remain in service. The Contractor's selection of equipment and methods shall consider the presence of such materials, and the Government will not be responsible in any way for the effect of such items on the Contractor's equipment or progress. Where indicated, remove existing metal items to the limits noted on drawings.

## 1.10 SEQUENCING AND SCHEDULING

Unless otherwise specified, perform the work in such sequence that work does not damage previously completed work. Do not perform concrete removal and other operations which cause vibrations within 30 feet of repair materials that have cured less than 24 hours. Provide protective measures as required to protect completed work.

## 1.11 CONSTRUCTION TOLERANCES

### 1.11.1 Concrete Depth Removal

Remove concrete to the lines of removal indicated on the contract drawings or sound concrete. Concrete removals that vary by more than the indicated

tolerance will not be acceptable, unless approved in advance by the Contracting Officer or indicated in the approved Letter of Acceptance of Government's Defect Quantities. Unauthorized concrete removals shall be repaired by the Contractor to the satisfaction of the Contracting Officer and at no additional cost to the Government.

1.11.2 Concrete Area Removal

Area removal tolerance shall be within 25 percent of the areas indicated in the contract drawings. Concrete removals that vary by more than the indicated tolerance will not be acceptable, unless approved by the Contracting Officer or indicated in the approved Letter of Acceptance of Government's Defect Quantities. Unauthorized concrete removals shall be repaired by the Contractor to the satisfaction of the Contracting Officer at no additional cost to the Government.

1.11.3 Repair Materials and Products

Place repair materials to the lines indicated on the drawings. Construction tolerances for concrete and mortar repair materials shall meet the requirements of ACI 117.

1.12 Field Measurements

Prior to beginning any repair work, the Contractor shall perform a survey of the structure to verify all repair quantities and locations indicated on the drawings. The Contractor shall notify the Contracting Officer in writing of any discrepancies effecting the quantities, price, or schedule of the work prior to beginning construction.

Contractor shall submit the field survey results and Letter of Acceptance of Government's Defect Quantities within 30 days of award.

1.13 SAFETY

Perform all work in accordance with EM 385-1-1. To protect personnel from overexposure to toxic materials, conform to the applicable Manufacturer's Material Safety Data Sheets (MSDS) or local regulations.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Pre-Packaged Material

2.1.1.1 Form-and-Pump / Form-and-Pour Material

The pre-packaged form and pump and form and pour materials shall be extended with coarse aggregate in accordance with the manufacturers written instructions.

2.1.2 Water

Water for cleaning, mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

### 2.1.3 Reinforcing Steel

Replacement criteria for existing steel reinforcement is depicted on the drawings. If replacement of existing steel reinforcement is required, steel bars shall comply with the requirements of ASTM A706/A706M, deformed, of the grades and sizes shown.

### 2.1.4 Embedded Galvanic Anodes

The test data shall meet the performance requirements specified in paragraph entitled "Embedded Galvanized Anodes" herein.

### 2.1.5 Bonding Compound

Bonding compounds shall not be permitted. Provide a roughened clean surface for bonding in accordance with ICRI Division 310 concrete surface profile chips.

### 2.1.6 Joint Injection Materials

#### 2.1.6.1 Injection Grout

Two materials shall be selected and submitted for joint repairs. Material one shall be a injectable grout sufficient for use in above water applications.

Material two shall be an injectable grout sufficient for use in below water applications.

Materials shall be either an epoxy or polyurethane injectable product capable of providing a water tight seal to the the joints inside the dry dock and around the faces of the pump well. Submit manufacturer's written recommendations for the use of the products including a minimum of three past projects of similar construction where product installation was successful.

## 2.2 MIXTURE PROPORTIONING

### 2.2.1 Pre-Packaged Material

Proportion materials in accordance with manufacturer's recommendations. Materials shall comply with the requirements of Paragraph entitled "Pre-Packaged Material" herein.

# PART 3 EXECUTION

## 3.1 EQUIPMENT

Assemble at the site of the work sufficient equipment that is dependable, appropriate, and adequate to accomplish the work specified and as recommended by product manufacturers. Deliver the equipment with sufficient time before the start of repairs to permit thorough inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required. Machines, tools, and equipment used in the performance of the work shall be approved before the work is started and shall be maintained in satisfactory condition at all times. Maintain the equipment in good working condition.

### 3.1.1 Surface Preparation and Mixing Equipment

Surface preparation shall be in accordance with applicable requirements of ICRI Guideline No. ICRI 310.1R-2008 and ACI 546.3R unless specified otherwise. Mixing equipment shall be in accordance with the specifications and manufacturers recommendations.

### 3.1.2 Drilling Equipment

Use percussion or rotary drilling equipment of a type suitable for the depth, diameter and material to be drilled. Use only rotary drilling equipment where vibration from percussion drilling could damage the concrete to remain or adjacent structures. Use equipment capable of maintaining the required alignment.

### 3.1.3 Diamond-Blade Cutting

Use diamond-blade cutting for cutting through relatively thin sections and defining limits of removal to be performed by other methods. Perform diamond blade cutting using equipment of the correct type and power and with appropriate blade composition for the material being cut. Roughen the cut surface in accordance with ICRI concrete surface profile scale CSP3 to CSP4.

### 3.1.4 Demolition Equipment

#### 3.1.4.1 Hydro Demolition Equipment

Hydrodemolition equipment shall consist of filtering and pumping units.

#### 3.1.4.2 Mechanical Demolition Equipment

Use a maximum 15 pound breaker for removal of concrete above and around reinforcing steel.

### 3.1.5 Pumping Equipment

The specified form-and-pump free-flowing repairs require pumping through a pump line to the formed cavity. Use hydraulic/swing valve pump for the best results. All pumping equipment must have adequate controls to regulate flow rates and pressure. Pressure shall be monitored with a pressure gauge.

## 3.2 PROTECTION

### 3.2.1 Protection of Existing Features

Before beginning any concrete removal work, carefully survey the structure and examine the drawings and specifications to determine the extent of the work. Take all necessary precautions to insure against damage to existing concrete or other structures to remain in place, and repair or replace any damage to such items as approved by the Contracting Officer at no additional cost to the Government. Carefully coordinate the work of this section with all other work, and construct and maintain shoring, bracing and supports, as required. Ensure that structural elements are not overloaded, and increase structural supports or add new supports as may be required as a result of any removal work performed under any part of this contract.

Protect and temporarily support all utilities that will be effected by the demolition and reconstruction work. Coordinate work with utility repair sections of the project.

### 3.2.2 Protection of Personnel

Ensure that adequate measures are in place to protect workers, facility operation personnel and the public from injury due to the operations being performed. Provide protective measures in accordance with EM 385-1-1.

## 3.3 REMOVAL OF EXISTING CONCRETE

The following is intended to supplement Section 02 41 00 DEMOLITION AND DECONSTRUCTION.

### 3.3.1 General

Interior concrete work shall be completed to minimize impacts on the active work environment of the pump well. Full containment of all work areas shall be required. Debris and water shall be contained and cleaned up at the end of each work shift. All concrete repair work shall be completed prior to utility work inside of the pump well. Any damage to the existing equipment inside the pump well shall be the responsibility of the Contractor and shall be repaired or replaced at no additional cost to the Government.

Final phases of demolition shall produce a highly roughened, bondable surface in accordance with ICRI concrete surface profile scale CSP5 to CSP7.

Remove the existing concrete in the area to be repaired to the minimum depth indicated on drawings. Remove concrete with care to avoid damage to adjacent structures and concrete that is not to be repaired under this contract and embedded metal that is not to be removed. Repair any such damage at no additional cost to the Government. Mark on the surface the limits of concrete removal for approval by the Contracting Officer prior to any removal.

Care must be exercised to ensure that further damage to reinforcement is not caused by the concrete removal process. Chipping operation can damage reinforcing steel and/or its bond to existing concrete if used. Constant vigilance must be exercised to assure maintenance of the necessary standards of workmanship. For this reason, a reinforcing bar locator shall be used to determine the depth, size, quantity, and approximate location of the reinforcement and other items embedded in the concrete.

Care shall be taken not to vibrate the reinforcement or otherwise cause damage to its bond to concrete adjacent to the repair area.

Do not remove metal and other embedded items exposed during the concrete removal operations without authorization of the Contracting Officer. Unless otherwise indicated, continue removal using appropriate equipment to remove unsound concrete and to eliminate any offsets in the area to be repaired which would cause an abrupt change in thickness of the repair and to remove protrusions between holes. Variations in the final prepared surface shall not exceed the nominal maximum size aggregate of the repair material, except for relatively thin repairs in which case the variation shall not exceed 25 percent of the repair thickness. Any removal beyond the limits shown on the drawings shall be approved by the Contracting

Officer prior to performing the additional removal. All equipment and removal methods shall comply with applicable sections of EM 385-1-1 and ACI 546R.

Concrete removal addresses deteriorated and damaged material. Some sound concrete, however, may be removed to permit structural modifications and to ensure that all unsound material is removed. The effectiveness of various removal techniques can differ for deteriorated and sound concrete. Some techniques may be more effective in sound concrete, while others may work better for deteriorated concrete.

Concrete removal techniques selected shall be effective, safe, economical, environmentally friendly, and minimize damage to the concrete left in place. The removal technique chosen may have a significant effect on the length of time that a structure will be out of service. Some techniques permit a significant portion of the work to be accomplished without removing the structure from service. The same removal technique, however, may not be suitable for all portions of a given structure.

3.3.1.1 Determination of Removal Limits

Approximate locations and areas of repairs are indicated on the drawings. Determine actual locations and limits of deteriorated concrete by visual inspection and by tapping with a hammer or steel rod and listening for dull or hollow sounds. On horizontal surfaces, a chain drag may be used in lieu of the hammer or rod. Perform sounding in the presence of the Contracting Officer or authorized representative. Mark areas where sounding does not produce a solid tone with highly visible paint. After the investigation process is completed, the Contracting Officer will inspect the areas marked by the Contractor to confirm and/or adjust the limits of removal. Do not remove concrete from these areas until the Contracting Officer or authorized representative approves the areas. Upon completion of removal, sound the surface and remove additional concrete until testing produces a solid tone.

Areas requiring repair shall be modified to provide for simple layouts. The layouts shall provide for reduced boundary edge length and eliminate acute angles.

Removal of concrete around reinforcing bars shall extend to point where bar is well bonded to concrete and free of corrosion products.

In cases where apparently corroded or heavily oxidized reinforcing bars extend beyond marked repair areas into apparently sound concrete, the Contracting Officer shall direct the Contractor how far to extend limits of repair area.

The extent and depth of concrete removal in each repair area shall be measured and recorded on drawings by the Contractor.

3.3.1.2 Perimeter Saw Cut

For repair areas make a perpendicular saw cut at least 3/4 inches deep, but no deeper than the reinforcing steel, 2 inches outside of the area to be repaired to delineate the perimeter of the repair area and avoid feather edges. The perimeter of repairs shall be provide right angle cuts to the concrete surface by saw cutting. Exercise care not to cut through existing steel reinforcement or embedded metal that is not to be removed.

The disc cut surfaces shall be roughened prior to application of a repair material. It is best achieved at the same time as final surface preparation of exposed reinforcement and concrete in repair cavity is conducted. Care shall be exercised when roughening the disc cut surfaces to prevent damage to the cavity edges.

3.3.1.3 Reinforcing Steel

Exposing and undercutting reinforcing steel in the repair area shall be accomplished by initial concrete removal operations. The reinforcing bars exposed in the repair areas shall be undercut a minimum of 3/4 inches or 1/4 inch larger than the largest size aggregate in repair material. Removal of concrete around reinforcing bars shall extend to the point where bars are well bonded to concrete and within allowable bar diameter tolerances

Following the concrete removal operation, carefully inspect the condition of all exposed reinforcing bars in accordance with ICRI 310.1R-2008.

The purpose of the inspection is to determine whether the reinforcing steel is capable of performing as intended by the design. If the cross-section of the repair has been reduced by corrosion by more than 20 percent, cut out the damaged portion and weld splice in replacement bar. Welding shall be performed in accordance with ACI 318 and AWS D1.1/D1.1M. Cutting and welding shall be performed by a welder AWS Certified to the requirements of AWS D1.4/D1.4M. Care shall be exercised during the welding procedures not to overheat the existing concrete because this can induce thermal stresses upon cooling and could damage the bond between existing reinforcement and concrete substrate.

Concrete reinforcement shall conform to the requirements of ASTM A706/A706M. Where the bond between the concrete and any reinforcing steel has been destroyed, or where the concrete deterioration is caused by corrosion of the reinforcing steel, remove the adjacent concrete to a depth that will permit cleaning of the steel and bonding of the concrete.

When uncoated reinforcing steel is exposed in the repair area, application of a protective coating shall not be done, because it may cause corrosion in areas immediately adjacent to a repair.

Proper cleaning of the rebar helps to assure the anode tie wires are able to make a good electrical connection. Since the anodes function on electrochemical principles, maintaining low resistance connections ensures peak performance.

3.3.2 Impacting

Take adequate precautions to prevent impact equipment from vibrating on reinforcing steel. All demolition equipment shall be subject to approval of the Contracting Officer.

3.4 MIXING MATERIALS

Make batches small enough to ensure placement before binder sets. Mix materials in accordance with manufacturer's recommendations.

## 3.5 SUBSTRATE SURFACE PREPARATION

### 3.5.1 General

Regardless of the nature of repair material and methods of its application, the repair is only as good as the surface preparation of the substrate to form a composite system with the repair material.

The surface of existing concrete and reinforcement shall be prepared in accordance with applicable requirements of ICRI 310.1R-2008 and ACI 546R unless specified otherwise.

After removal of concrete to the specified limits, clean the surface to which the repair material is to be applied to remove dust, debris and laitance. Perform final cleaning immediately prior to placement of the repair material. The moisture condition of the concrete substrate prior to application of the repair material shall be saturated surface dry (SSD).

### 3.5.2 Cleaning

Mechanical demolition equipment leaves the resulting surface with varying degrees of microcracks and fractures, commonly referred to as "bruising". Bruising creates a zone of weakness that will affect the bond of the repair material to the substrate. Removal subjects the concrete substrate to a wide range of dynamic loads and the resulting bruising will depend on the method used and the quality of the concrete. The depth of the bruised layer varies, but is typically on the order of 1/8 inch. Use hydrodemolition or sandblasting equipment capable of eroding the substrate concrete surface. The equipment shall produce a highly roughened, bondable surface in accordance with ICRI concrete surface profile scale CSP5 to CSP7.

Perform all cleaning operations to the satisfaction of the Contracting Officer. Protect adjacent structures and embedded items. Use potable water for all cleaning operations. Perform a preliminary washing as soon as the chipping is completed to remove loose materials and dust particles. Clean surfaces to which new concrete is to be bonded in accordance with ACI 546R, Concrete Repair Guide, Chapter 2, "Concrete Removal, Preparation, and Repair Techniques". Final cleaning shall remove all laitance, carbonation, scum, dirt, oil, grease, and loose or disintegrated concrete. Perform additional surface chipping to remove coarse aggregate that is undercut by cleaning process. Perform such additional chipping as determined necessary by the Contracting Officer at no additional cost to the Government. Wire brush or sandblast metal surfaces against which concrete is to be placed to remove rust and other contaminants which would prevent proper bond with the concrete. Perform final cleaning immediately prior to concrete placement. Protect all work from contamination during all phases of cleanup and preparation prior to repair.

### 3.5.3 Rust Cleaning

Freshly cleaned reinforcing steel may rust between the time it is cleaned and the time repair material is placed. If the rust that forms is tightly bonded to the rebar such that it cannot be removed by wire brushing, no action shall be taken. If the rust is loosely bonded so as to inhibit bond between the steel rebar and the repair material, the reinforcement shall be cleaned again before repair material is placed.

### 3.5.4 Waste Water Disposal

Dispose of waste water employed in cutting, washing, and rinsing of concrete surfaces in a manner such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. Refer to Section 01 57 19.00 22 TEMPORARY ENVIRONMENTAL CONTROLS - PORTSMOUTH NAVAL SHIPYARD (PWD ME).

## 3.6 SURFACE REPAIRS

The proper repair methods, material selection, and installation are critical for a successful repair project that is capable to provide the desired serviceability and durability. Each repair application places different demands on the repair materials, and the materials shall have suitable properties to meet these demands throughout the designed life of the repair.

Availability of repair materials and methods, cost effectiveness, and the technical feasibility of using them shall be considered. Manufacturers or suppliers can provide assistance in the selection of repair materials and application techniques. When selecting the appropriate repair material, one shall keep in mind that the technical data presented in manufacturer's literature may not be sufficient because the tests performed may not be representative of the use of the material in a particular application.

The range of acceptable performance criteria has to be selected using Guidance of the ACI 546.3R, "Guide for Selection of Materials for the Repair of Concrete," unless otherwise specified herein. ACI 546 R, Guide for Concrete Repair and ICRI Guideline 320.1R-1996 provide guidance for selecting application methods for repair.

The location of potential in-situ bond pull-off core locations shall be identified for each discrete repair area so reinforcing steel is not encountered during final acceptance testing.

### 3.6.1 General

Four concrete spall repair methods are specified for this project:

a. Form and Pump material applications shall be employed for all vertical and overhead repair locations with repair areas of 2 square feet or greater.
b. Form and Pour material applications shall be employed for all horizontal repair locations with repair areas of 2 square feet or greater.
c. Hand Trowel material applications shall be employed for all repair areas less than 2 square feet.
d. Dry Pack material applications shall be employed for repairing all in-situ bond pull-off core holes.

### 3.6.2 Formwork

Formwork calculations shall be stamped by a professional engineer. Formwork for repairs involving form-and-pump method shall be constructed in accordance with ACI 347, except for the calculation of form pressure. Form pressure shall be designed for a minimum of 14 psi in accordance with ACI E 706, Surface Repair Using Form-and-Pump Techniques. Maximum pressure exerted on formwork occurs after the formed cavity is full and pressurized. Forms shall be constructed to fit tightly against existing

concrete surfaces. Preformed foam gaskets or cast-in-place foam shall be used to address difficult to match surfaces. Remove forms after 7 days.

### 3.6.3 Form-and-Pump Repairs

#### 3.6.3.1 General

Form and pump repair is a method of replacing deteriorated or damaged concrete by filling the formed cavity with a repair material under pump pressure. The method is required for vertical and overhead repairs a minimum of 6 inches thick, and more than 2 square feet area. Formwork shall be constructed with strength sufficient to handle the pressure induced by hydrostatic pressure and the additional pump pressure required to consolidate the repair material. The cavity and formwork design shall provide for venting the air. Venting can be accomplished by the removal profile of the prepared concrete. Pumping the cavity is started at the lowest point in vertical repairs or at an extremity in overhead repairs. Pumping continues until the material flows from an adjacent port in the formwork. Pumping continues until the cavity is completely full. During the final pressurization, the repair material is consolidated around the reinforcing steel and driven into the crevices of the prepared substrate to improve bond.

The form-and-pump repairs shall be performed in accordance with ACI E 706, Surface Repair Using Form-and-Pump Techniques.

The form-and-pump is an advanced multi-step repair method of preparing and constructing formwork, and pumping the repair material into the cavity confined by formwork and existing concrete substrate. Prior to construction of the formwork, any substrate surfaces that may cause air to become trapped during the pumping operations must be trimmed, or vent tubes installed.

The concept of repair adopted in this project is to replace deteriorated concrete and address corrosion of reinforcement problems only where spalls and delaminations have occurred. This approach leaves chloride-contaminated concrete surrounding the repair area highly conductive to continued corrosion. The repair may actually aggravate corrosion in the areas adjacent to them. This is known as halo, or ring, or anodic effect.

To neutralize new corrosion cells, which will otherwise develop around the repair area, embedded galvanic anodes shall be installed in repair areas 2 square feet or greater to assure minimum of 15 years of sacrificial cathodic protection. The anodes shall be placed around the perimeter a maximum of 12 inches on center, as close as is practical to the edge of the repair to provide the best corrosion protection to the surrounding concrete. The wire ties shall be attached within 1 inch of the edge of the repair area. Submit anode placement details.

Confirm electrical continuity of the exposed reinforcing steel within the repair area. Loose reinforcing steel shall be tied to existing bars tightly with uncoated steel tie wires or welded.

Confirm electrical continuity between anode, tie wire, and reinforcing steel with a multi-meter. A CP Specialist shall perform testing and provide a detailed continuity test report at the end of the project.

3.6.3.2 Pumping Procedure

Pumping of the repair material mixtures shall be in conformance with ACI 304.2R, ACI E 706 and specified requirements. Attachment of the pump line hose to the formwork can be achieved by use of plumbing fittings with flanges and ball valves.

The sequence of material placement and amount of ports into the formed cavity depends on location and geometry of the repair involved. Vertical surfaces shall start at the lowest point, filling in the manner that prevents air entrapment. Arrangement of ports for pump line attachments is usually horizontal. Pumping continues even after material flow occurs from adjacent ports to expel air. When the flow is without intrusion of air, the pump is temporarily shut off, the port closed off, and the pump line connected to the adjacent port. The sequence is continued until the cavity is filled. In some conditions, the cavity can be pumped from one port. In this situation, each adjacent port is capped off as flow occurs. It is necessary to monitor pump-line pressure with a pressure gauge to confirm cavity pressurization and prevent excessive backpressure when pumping long distances. Once the cavity is filled, the full-line pressure is available to pressurize the formed cavity. The formed cavity shall target to be pressurized to a 3 to 5 psi increase in line pressure near the cavity port.

Before starting the pumping operation, there shall be a direct, continuous communication established between the pump operator and crew at the formwork. The crew at the formwork shall direct the pump.

Care must be exercised in the final pressurization because the excessive pump-line pressure (hydraulic pumps can exert in excess of 800 psi) may cause the form to fail. Pressure gauges shall be attached to the pump line near the exit to monitor cavity pressure. If the formwork fails due to over-pressurization, the failure will generally occur as a slight movement in a form panel seam or perimeter seal.

Overhead placements are accomplished by starting at an extremity of the surface and proceeding in a fashion similar to vertical placements. Material will flow radically from the injection port to the adjacent ports.

Exterior vibrators shall be used for repair consolidation as conditions determined by the trial sample repairs require. All vibration operations shall be completed prior to pressurizing the form. Vibration after pressurization may cause unwanted movement and overstressing of the form.

3.6.3.3 Curing

The form-and-pump material repairs shall be cured in forms for no less than 7 days.

3.6.4 Form-and-Pour

Top surface partial depth repairs may assist in reinstating load carrying capacity in some instances, but their usual function is to reinstate protection to the reinforcement locally rather then to act structurally. Conventional concretes and pre-packaged repair materials extended with aggregate are usually employed for this application.

The placement process and equipment shall be arranged to deliver the

material to its final position without segregation. The equipment shall be adequately and properly arranged so that placing can proceed without undue delays and manpower shall be sufficient to ensure the proper and timely placing, consolidating, finishing and curing of the repair.

Temperature of the repair material mixture shall be between 50 degrees F and 85 degrees F, and it shall not vary more than approximately 10 degrees F from the temperature of the substrate against which it is placed.

The material placement procedure shall begin by slightly overfilling the repair cavity to allow for the reduction in volume. The repair material must fully encapsulate exposed reinforcing steel and achieve satisfactory bond with the substrate. Vibration of the repair material shall be performed by interior vibrators or vibrating screeds or both in combination.

Surface finishing (beyond floating) shall not be initiated before initial set nor before bleeding water has disappeared from the repair surface.

Repair material shall be carefully finished to the cross-section of existing structure. The recommended finishing process is to screed from the center of the repair out to the repair boundaries. This will provide the smoothest interface with the existing concrete and will develop an adequate bond at the perimeter of the repair.

Following repair, consolidation of the finishing operations shall be conducted in a manner in which the repair material is worked and manipulated as little as possible to produce the desired result.

All topical horizontal repairs shall employ the form-and-pour repair method. Formwork may not be required. Advanced planning shall ensure an adequate and consistent supply of repair material during the placement operations.

The placement process and equipment shall be arranged to deliver the material to its final position without segregation. The equipment shall be adequately and properly arranged so that placing can proceed without undue delays and manpower shall be sufficient to ensure the proper and timely placing, consolidating, finishing and curing of the repair.

### 3.6.5 Hand Trowel

Areas of less than 2 square feet shall be repaired using a hand trowel method. Use care to ensure a bond between the repair and existing concrete substrate.

### 3.6.6 Cold Weather Repair Operations

Comply with the requirements of ACI 306.1. Do not allow concrete or repair material temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete and repair material when ambient temperature is below 40 degrees F or when concrete or repair material is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and repair material and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

3.6.7 Hot Weather Repair Operations

Hot weather is any combination of the following conditions that tends to impair the quality of freshly mixed or hardened cement-based concrete and repair material by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results:

a. High ambient temperature

b. High concrete temperature

c. Low relative humidity

d. Wind speed

e. Solar Radiation

Maintain required concrete and repair material temperature using Figure 2.1.5, "Effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R to prevent the evaporation rate from exceeding 0.2 pounds of water per square foot of exposed concrete and repair material per hour. Cool ingredients before mixing or use other suitable means to control concrete and repair material temperature and prevent rapid drying of newly placed concrete and repair material. Shade the fresh concrete and repair material as soon as possible after placing. Start curing when the surface of the fresh concrete and repair material is sufficiently hard to permit curing without damage. If the evaporation rate exceeds 0.1 pounds of water per square foot per hour, fog spray the exposed concrete and repair material surfaces until active moist curing is applied. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete and repair material surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete and repair material when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete and repair material is set. Concrete and repair material temperatures shall be limited to 90 degrees F at the time of placement. Internal concrete and repair material temperatures at any time during the construction shall not exceed 150 degrees F.

The following list of measures to reduce or avoid the potential problems of hot weather repair operations must be considered:

a. Cool the material mixture;

b. Minimize the time to transport, place, consolidate, and finish the repair;

c. Plan the job to avoid adverse exposure to the environment; schedule placing operations during times of the day or night when the weather conditions are favorable;

d. Protect the repair from moisture loss during placing and curing periods; and

e. Schedule a pre-placement meeting to discuss the requirements of hot weather repair operations.

Preparations shall be made to transport, place, consolidate, and finish the repair material in the fastest possible time.

Delivery to the repair location shall be performed so the material mixture will be placed promptly. If necessary, the repair material mixture shall be cooled by using ice for part of the mixture water available for substitution.

### 3.6.8 Dry Pack Repairs

Dry packing techniques shall be used to fill core holes after pull tests. Other applications are generally small cavities, small areas of surface honeycomb, or rib bottoms. Dry pack shall not be used for relatively shallow cavities where lateral restraint cannot be obtained.

Dry packing is a repair method of placing zero-slump, or near zero-slump, concrete or mortar, by ramming into surface cavities. Sufficient water shall be used to produce a mix that will stick together while being molded into a ball with the hands and will not exude water, but will leave the hands damp. Any less water will not make a sound, solid pack; any more will result in excessive shrinkage and failure.

A bonding agent consisting of neat cement, cement-sand, or latex-cement-sand shall be used because dry pack lacks the extra moisture necessary to promote good bond.

Compaction densifies the repair material and provides the necessary intimate contact with the existing concrete for achieving adequate bond. Dry pack shall be solidly compacted over the entire surface by a hardwood stick and a hammer. Much of the tamping shall be directed at a slight angle and toward the sides of the cavity to assure maximum compaction in these areas. Each dry pack repair is usually placed in layers.

Because of the relatively small volume of most repairs and the tendency of old concrete to absorb moisture from new material, water curing is a necessary procedure at least during the first 72 hours. The best results are accomplished with a continuous 7-day moisturizing and shall be implemented.

## 3.7 JOINT REPAIR

### 3.7.1 Joint Repair

#### 3.7.1.1 Preparation

Clean each joint of dust, dirt, loose concrete and unsound material by vacuuming or flushing with water. In above water and open areas allow free water in the joint to dry. Insert a valve at both ends of each joint at the junction of two joints, and along the length of each joint at approximately 16 to 20 inch intervals. Spacing shall be defined by product manufacturer. Fill joint between valves with joint surface sealer. Do not insert valves into the tide markers on the wall of the dry dock. Access to the walls of the dry dock shall be coordinated with the Contracting Officer and completed in the sequence shown on the drawings.

#### 3.7.1.2 Injection

After joint surface sealer has hardened and cured, pump injection grout

into valve at one end of crack. For vertical surfaces start at lowest valve and work upwards. As joint sealer appears at next valve, pinch pumping valve closed and move to next valve and commence pumping. Continue procedure until other end of joint is reached. Avoid delays in pumping operation. After joint sealer has hardened and cured grind valves off flush with concrete surface. Coat areas of valves with joint surface sealer and allow to harden and cure.

## 3.8 CURING AND PROTECTION

a. ACI 301 and ACI 308R unless otherwise specified. Prevent concrete and repair materials from drying by misting surface of concrete and repair materials. Begin curing immediately following final set. Avoid damage to concrete and repair materials from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, by rain or running water, adverse weather conditions, and any other activity resulting in ground vibrations. Protect concrete and repair materials from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete and repair materials to dry out from time of placement until the expiration of the specified moist curing period.

b. Moist cure of 7 days minimum is required. Leaving forms in place during this time meets this requirement. Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage. After completion of moist cure, a curing compound shall be used for the remainder of the 28 day curing period.

### 3.8.1 Moist Curing

#### 3.8.1.1 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

#### 3.8.1.2 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete and repair materials nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

#### 3.8.1.3 Impervious Sheeting

Wet the entire exposed surface of the concrete and repair materials thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete and repair material surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete and repair material surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Overlap and continuously tape sheeting joints; and introduce sufficient

water to soak the entire surface prior to completely enclosing.

### 3.8.2 Liquid Membrane-Forming Curing Compound

Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing from 7 day moist cure has disappeared from the concrete and repair material surface. Provide and maintain compound on the concrete and repair material surface throughout the remainder of the 28 day curing duration curing period. Do not use this method of curing where the use of Figure 2.1.5, "Effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pounds of water per square foot per hour.

#### 3.8.2.1 Application

Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Respray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

#### 3.8.2.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

### 3.8.3 Curing Periods

Moist cure concrete and repair material using potable water for a minimum of 7 days. Continue additional curing for a total period of 28 days. Begin curing immediately after placement. Protect concrete and repair material from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete and repair material. The materials and methods of curing shall be subject to approval by the Contracting Officer.

## 3.9 FIELD QUALITY CONTROL

### 3.9.1 General

An independent material inspection and testing Contractor shall perform the required field inspection and test procedures outlined in this Section, on a daily basis when concrete is being delivered or when pre-packaged material is being batched on-site.

### 3.9.2 Preparations for Placing

A qualified licensed Professional Engineer (PE) must inspect prepared surfaces, forms, and embedded items in sufficient time prior to each placement of repair material to certify that the surfaces are ready to receive the repair material. The professional engineer shall fill out,

sign, and submit the QC Inspection Checklist prior to contractor placing repair material. Blank QC Inspection Checklist is included at the end of this Section.

3.9.3 Concrete and Pre-Packaged Material Testing

3.9.3.1 Time and Mix Pot Life

Verify repair material has not exceed allowable time or pot life.

3.9.3.2 Sampling

Collect representative sample of fresh concrete or pre-packaged mortar repair material to perform test specified in conformance with ASTM C172 and ASTM C31/C31M.

3.9.3.3 Temperature

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions below 50 degrees F and above 80 degrees F for each batch (minimum) or every 10 cubic yards (maximum) of concrete and repair material, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.9.3.4 Air Content

Test air content twice during each shift that repair material is placed. Obtain samples in accordance with ASTM C172 and test in accordance with ASTM C231/C231M.

3.9.3.5 Slump

Test slump twice during each shift that repair material is produced. Obtain samples in accordance with ASTM C 172 and test in accordance with ASTM C143/C143M.

3.9.3.6 Consolidation and Protection

Ensure that the repair material is properly consolidated, finished, protected, and cured.

3.9.3.7 Compression Tests

Prepare compression test specimens during each shift that the repair material is produced in accordance with ASTM C31/C31M and cure at the site under the same conditions as the repair. Test in accordance with ASTM C109/C109M or ASTM C39/C39M.

3.9.3.8 Curing

a. Moist-Curing Inspections - At least once each shift, and once per day on nonwork days, inspect all areas subject to moist curing. Note and record the surface moisture condition.

b. Sheet-Curing Inspection - At least once each shift and once per day on nonwork days, inspect all areas being cured using material sheets.

Note and record the condition of the covering and the tightness of the

laps and tapes.

3.9.3.9 Aggregates

Test gradation in accordance with ASTM C136 and ASTM C117. Determine the percent passing the No. 200 sieve by washing in accordance with ASTM C117.

3.9.4 Action Required

3.9.4.1 Placing

The placing foreman shall not permit placing to begin until they have verified that appropriate placement, consolidation, and finishing equipment, are available. Equipment shall be in working order and have competent operators.

3.9.4.2 Time and Mix Pot Life

Dispose of material if it is beyond the designated time or pot life.

3.9.4.3 Air Content

Whenever a test result is outside the specification limits, do not deliver the concrete or repair material to the forms and adjust the dosage of the air-entrainment admixture.

3.9.4.4 Slump

Whenever a test result is outside the specification limits, do not deliver the concrete or repair material to the forms and an adjustment shall be made in the batch weights of water and fine aggregate. The adjustments shall be made so that the water-cementitious materials ratio does not exceed that specified in the submitted concrete mixture proportion.

3.9.4.5 Temperature

Whenever a test result is outside the specified limits, dispose of material and prepare a new batch.

3.9.4.6 Curing

a. Moist-Curing Corrective Action - When a daily inspection report lists an area of inadequate curing, take immediate corrective action, and extend the required curing period for such areas by one (1) day.

b. Sheet-Curing Corrective Action - When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, promptly repair the tears and holes or replace the sheets, close the joints, and extend the required curing period for those areas by 1 day.

3.9.4.7 Laboratory Test Results

If compression test results fall outside of specified limits, remove defective material and install material meeting specified limits.

### 3.9.5 Final Inspection and Acceptance Testing

Following completion of the work, inspect surfaces for damage, staining, and other distresses. Inspect repairs for cracking, crazing, delamination, unsoundness, staining and other defects. Inspect the finish and surface tolerances of the repairs to verify that all requirements have been met. Repair all surfaces exhibiting defects as directed at no additional cost to the Government when defects are due to Contractor workmanship or procedures. Contractor to submit procedures to repair defective work prior to completing repairs.

Perform repair acceptance pull-off bond testing in accordance with the ICRI 210.3-2004, "Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials" and ASTM C1583/C1583M. Bond strength shall not be less than 150 psi, unless failure is at least 1 inch into the existing concrete substrate. Areas damaged by pull-off bond tests shall be repaired with dry pack repair material.

Contractor shall perform ten (10) pull-off bond tests, unless directed otherwise by the Contracting Officer. Perform completed repair acceptance pull-off bond testing at ages consistent with the trial repair pull off testing. Perform bond pull-off test quantities in accordance with ICRI 210.3-2004.

The location of each individual test in designated test areas will be selected by the Contracting Officer prior to repair application and marked on a drawing in order to avoid cutting the reinforcing steel during the test performance.

The following acceptance criteria shall be satisfied:

a. Minimum Bond Strength
No individual test result is below 75% of the specified pull-off bond strength.

b. Average Bond Strength
Average pull-off bond strength of the specimens is not less than the specified strength.

### 3.9.6 Reports

Report the results of all tests and inspections conducted at the project site informally at the end of each shift and in writing weekly and deliver within 3 days after the end of each weekly reporting period.

Reports on lab tests shall be submitted within 35 days of pouring operations.

### 3.9.7 Manufacturer Field Service

Provide, at no additional cost to the Government, the services of the manufacturer's experienced technical representative during mixture proportioning, planning and production. The manufacturer's representative shall be available for consultation by both the Contractor and the Contracting Officer during mixture proportioning, planning, and production of the materials and shall be on-site immediately prior to and during at least the first placement of the material, and at other times if directed.

## 3.10 CLEAN UP

Clean all surfaces of concrete and adjacent facilities which are stained by dirt, oil, grease, fuel, or other byproducts that are created by the construction operations with detergent and pressure wash. Dispose of debris in accordance with applicable local, State, and Federal laws.

## 3.11 PROTECTION PRIOR TO ACCEPTANCE

Do not permit vehicular or heavy equipment traffic on the repair surfaces until the repair material has obtained the designed strength. Permit light local traffic on the concrete surfaces at the end of the curing period, if approved by the Contracting Officer. Where shelter or other protective measures are provided for repair during inclement weather, maintain such protective measures until the repair material has cured and discontinuance of the measures is authorized.

## 3.12 FINAL ACCEPTANCE

All defects shall be inspected and documented prior to any repair being completed. Contractor shall submit procedure to the Contracting Officer and the A/E for approval prior to repairing any defects.

Contractor shall repair all cracks in repairs prior to the end of the warranty period at the 11 month period.

**QC INSPECTION CHECKLIST**

| | | | |
|---|---|---|---|
| PROJECT: | | CONTRACTOR | NAME: |
| PROJECT LOCATION: | | | ADDRESS: |
| | | | PHONE: |
| DEFECT ID: | | PROFESSIONAL ENGINEER | NAME: |
| DEFECT LOCATION: | | | LICENSE NUMBER: |

**INSPECTION TASKS**

| TASK: | DATE COMPLETED: | PROFESSIONAL ENGINEER SIGNATURE: |
|---|---|---|
| DETERMINATION OF REMOVAL LIMITS | | |
| CONCRETE DEMOLITION | | |
| CONCRETE DEPTH REMOVAL | | |
| SUBSTRATE SURFACE PREPARATION | | |
| RUST CLEANING | | |
| ANODES INSTALLED | | |
| CONTINUITY TEST | | |
| PULL-OFF BOND TEST CORE LOCATION MARKED | | |
| FORMWORK INSTALLED | | |
| FORMWORK SEALED | | |
| FORM REMOVAL | | |
| Curing | | |
| FIELD QUALITY CONTROL | | |
| FINAL INSPECTION | | |
| PULL-OFF BOND TEST | | |
| FINAL ACCEPTANCE | | |

**REPAIR QUANTITIES**

| TASK: | QUANTITY: | DATE INSTALLED: |
|---|---|---|
| REINFORCING STEEL (LBS) | | |
| ANODES (EA) | | |
| CONCRETE (SF) | | |

-- End of Section --

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