



DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD

CIVIL ENGINEERING UNIT OAKLAND
OAKLAND, CALIFORNIA 94606-5337

PSN 526741

SPECIFICATIONS

FOR

TONGUE POINT WLB PIER REHAB

AT

TONGUE POINT FACILITY

ASTORIA, OREGON

Civil Engineering Unit Oakland	Initial	Date
Steve McGrath, P.E. PROJECT MANAGER	<i>[Signature]</i>	7/1/08
Richard J. Kowalski, Jr. P.E. CHIEF, FACILITY ASSET MANAGEMENT DIVISION	<i>[Signature]</i>	7/1/08

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 10 00 – GENERAL PARAGRAPHS

PART 1 GENERAL

- A. SCOPE OF WORK: SCOPE OF WORK: Furnish all labor, materials, and equipment necessary to perform the Rehabilitation to the WLB Pier at USCG Tongue Point Facility.

1) Bid:

- (a) The bid shall be prepared to include separate pricing for the Base Bid and each Bid Option 1 through 4.
- (b) The Contractor's Bid shall include all costs associated with construction phasing as identified in the Drawings and Specifications in a manner that does not disrupt operations of the CGC Fir when it is at the Tongue Point WLB Pier during construction. Each Bidder shall submit as part of the bid a detailed written Phasing Plan describing the approach for compliance with the phasing provisions for the Government's review. The Phasing Plan submitted shall be a critical consideration in the Government's decision to award the bid. The determination on suitability of the Phasing Plan shall be at the Government's sole discretion.
- (c) The Contractor's Bid shall include all costs associated with environmental compliance as identified in the Drawings and Specifications and in the permits when and as issued.

2) Construction Scope:

- (a) Approximate quantities of the work for the Base Bid and Options are shown on Sheet 5 (Work Plan) of the Drawings. The work includes but is not limited to the following:
 - (i) Base Bid:
 - 1. Removal and off-site disposal of approximately 11,000 sf of existing pier including concrete deck, timber piles, timber pile caps, timber braces, appurtenances and various stub piles associated with prior construction as required to complete the Base Bid work.

2. Temporary terminations of utilities, utility demolition and temporary utility relocations as required by the Drawings and necessary to provide temporary electric, water, sewer and communications services to the CGC Fir while construction is on going.
3. Salvage identified items on the Drawings including electrical and communication systems, for reuse and protect structures and appurtenances to remain.
4. Construct approximately 11,000 sf of new pier including all piles, pile caps, concrete deck planks, overlay, curbing, utilities, and appurtenances as called out on the Drawings and Specifications necessary to complete Base Bid work.
5. Construct timber bracing at interface with existing pier to remain, connect new pier to existing fender system and construct transition plates between existing pier and new pier.

ii. Option 1:

1. Removal and off-site disposal of approximately 1,800 sf of existing pier including concrete deck, timber piles, timber pile caps, timber braces, appurtenances and various stub piles associated with prior constructions as required to complete Option 1.
2. Utility demolition and modifications as called out on the Drawings.
3. Salvage identified items on the Drawings for reuse and protect structures and appurtenances to remain.
4. Construct approximately 1,800 sf of new pier including all piles, pile caps, concrete deck planks, overlay, curbing, utilities, and appurtenances as called out on the Drawings and Specifications necessary to complete the Option 1 work.
5. Construct new water service vault and electric service pedestal.
6. Construct timber bracing at interface with existing pier to remain, connect new pier to existing fender system and construct transition plates between existing pier and new pier.

iii. Option 2:

1. Removal and off-site disposal of approximately 1,800 sf of existing pier including concrete deck, timber piles, timber pile caps, timber braces, appurtenances and various stub piles associated with prior constructions as required to complete the Option 2 work.
2. Utility demolition and modifications as called out on the Drawings.
3. Salvage identified items on the Drawings for reuse and protect structures and appurtenances to remain.
4. Construct approximately 1,800 sf of new pier including all piles, pile caps, concrete deck planks, overlay, curbing, utilities, and appurtenances as called out on the Drawings and Specifications necessary to complete the Option 2 work.
5. Construct timber bracing at interface with existing pier to remain, connect new pier to existing fender system and construct transition plates between existing pier and new pier.

iv. Option 3:

1. Removal and off-site disposal of approximately 900 sf of existing pier including concrete deck, timber piles, timber pile caps, timber braces, appurtenances and various stub piles associated with prior constructions as required to complete the Option 3 work.
2. Removal and off-site disposal of 3 fender piles.
3. Utility demolition and modifications as called out on the Drawings.
4. Salvage identified items on the Drawings for reuse and protection of structures and appurtenances to remain.
5. Construct approximately 900 sf of new pier including all piles, pile caps, concrete deck planks, overlay, curbing, utilities, and appurtenances as called out on the Drawings and Specifications necessary to complete the Option 3 work.
6. Construct salvaged yard light
7. Construct 3 new fender piles and necessary chocks and D-fenders.

8. Construct timber bracing at interface with existing pier to remain, connect new pier to existing fender system/new fender piles and construct transition plates between existing pier and new pier.

v. Option 4:

1. Removal and off-site disposal of approximately 1,200 sf of existing pier including concrete deck timber piles, pile caps, braces, appurtenances and various stub piles associated with prior constructions as required to complete the Option 4 work.
2. Removal and off-site disposal of 5 fender piles.
3. Removal and off-site disposal of gangway platform, pile and bracing.
4. Salvage identified items on the Drawings for reuse and protection of structures and appurtenances to remain.
5. Construct approximately 1,200 sf of new pier including all piles, pile caps, concrete deck planks, overlay, curbing, utilities, and appurtenances as called out on the Drawings and Specifications necessary to complete the Option 4 work.
6. Construct 5 new fender piles and necessary chocks and D-fenders.
7. Construct timber bracing at interface with existing pier to remain, connect new pier to existing fender system/new fender piles and construct transition plates between existing pier and new pier.

3) Design Build Alternative:

- a. Bidders are allowed to submit a proposal based on an alternative design meeting the design requirements stated in "Pier Design Criteria" contained in the General Notes sheet in the Drawings and conforming to the phasing, demolition, environmental controls, dimensional, utility, and mooring hardware requirements provided in the Drawings and Specifications.
- b. The Alternative Design shall be submitted in sufficient detail for the Government to fully evaluate the proposal. Detailed design drawings will not be required at the proposal stage for alternate approaches to the work.
- c. Any design build alternative or deviation from the drawings or specifications shall be clearly identified and described

in the proposal.

d. The Government shall retain the right to accept, reject or request additional information at its sole discretion when evaluating any Alternative Bid submitted. The suitability of the submitted proposal shall be solely at the Government's discretion.

e. If alternate proposals are submitted, separate pricing for the Base Bid and Options 1 through 4 in accordance with the Government's approach shall be provided in the event the alternate proposal is not accepted.

1.02 LOCATION: The work is located at the U.S. Coast Guard Tongue Point Facility, Astoria, Oregon.

1.03 SITE INVESTIGATION: Investigate the site per FAR 52.236-3 to ascertain the general and local conditions which can affect the work or its cost. Contact USCG Tongue Point Facility, Doug Cameron, at (503) 325-2378 to arrange site access.

1.04 CONTRACTOR SECURITY REQUIREMENTS: For each affected Coast Guard facility, the Contractor shall provide a list of all on-site personnel, including sub-contractors (including second and third-tier subcontractors) and suppliers, to the Contracting Officer. The contractor shall update this list when changes occur. Contractor personnel not listed may be denied access to the Coast Guard facility. Contractor personnel will be restricted to designated working areas. Any personnel violating this policy may lose access to the Coast Guard facility. Contractor personnel shall have photo identification at all times while working on Coast Guard facilities.

Contractor and delivery personnel may be required to present personal photo identification to gain access to a Coast Guard installation. If identification does not indicate United States citizenship, Coast Guard Security may require proof of the legal right to work in the United States. Contractor and delivery personnel also may be subjected to an immigration status and outstanding criminal warrants check.

Contractors shall provide the Contracting Officer's Technical Representative with 24 hours of advance notice of every delivery to the site (e.g., concrete, lumber, parts, etc.) and provide the company name, delivery person, and phone number of the firm(s) making deliveries. All vehicle access to government property requires vehicle registration and proof of liability insurance. Otherwise access to the Coast Guard facility may be denied.

1.05 CONTINUITY OF FACILITIES OPERATION: See construction phasing notes on sheet 2 of 22 of Project Drawings. Schedule work to minimize interference with the facility's normal operations. Contact the Contracting Officer for approval 72 hours in advance of any shutdowns. Perform all on-site work between the

hours of 7:00 AM and 7:00 PM, Monday through Friday (Federal Holidays excluded), unless otherwise approved by the Contracting Officer.

- 1.06 NOTIFICATION OF START AND COMPLETION OF WORK: The Contractor shall notify the Contracting Officer in writing five (5) working days in advance of the date he intends to commence work, and five (5) working days prior to the date that work will be ready for final inspection.
- 1.07 RECYCLING AND DISPOSAL OF REFUSE: Refuse, excess or waste materials resulting from construction operations shall become the property of the Contractor and shall be recycled and/or disposed of off Government property. All disposal shall be done in accordance with federal, state, and local laws and regulations.
- 1.08 SAFETY: During the execution of this contract, the Contractor shall conform to the rules and regulations as set forth by OSHA Safety and Health Standards, 29 CFR Part 1926 - Safety and Health Regulations for Construction and State of Oregon, Division of Occupational Safety and Health, OR-OSHA. When the standards differ, the more restrictive standard shall apply. The Contractor shall provide barriers, temporary fencing, trench covers, etc. wherever work could cause injury to workers, visitors, Coast Guard personnel, or dependents.
- 1.09 TEMPORARY FACILITIES:
 - A. STORAGE: The location for exterior stock piling of materials is shown on the drawings. The Contractor shall be responsible for protecting materials stockpiled against weather, damage, theft, and other risks of loss. The Coast Guard assumes no responsibility for material or equipment left in the storage area.
 - B. SANITARY FACILITIES: There are no toilet facilities available for Contractor use at the job site. The Contractor shall provide his own facilities in accordance with 29 CFR 1926, Chapter XVII, Subpart D, paragraph 1926.51 (c) (1).
 - C. WATER AND ELECTRICITY: Water and 120V electricity are available at no cost to the Contractor. Cost of these utility connections and disconnections shall be the responsibility of the Contractor. Personnel using extension cords to bring power from another location to construction, maintenance, remodeling, etc., shall employ portable ground fault circuit interrupters (gfcis), even if connecting to building wiring.
 - D. TELEPHONE: No telephone service is available for Contractor use.
- 1.10 EXISTING UTILITIES: Utility locations shown are approximate. The Contractor shall field verify all utility locations. This shall include but not be limited to the use of sonic, electronic or magnetic detection devices, by noting pullbox and utility box locations at the surface, and by potholing.

Contractor shall be responsible for repairing any utilities damaged during construction at no additional cost to the Government. In addition to his own investigations, the Contractor shall contact the Oregon Utility Notification Center (800-332-2344) prior to waterfront work and provide work location information. Retain ticket number as proof of notification.

1.11 OREGON STANDARD SPECIFICATIONS: Whenever the Oregon Standard Specifications for Highway Construction are referenced, the following shall be understood:

- A. The terms Commission or Department shall mean the U.S. Government.
- B. The terms Director, Executive Officer, or Engineer shall mean the Contracting Officer.
- C. All references to measurement and payment are deleted.

1.12 DRAWINGS: The work shall conform to the drawings listed below which form a part of these specifications.

<u>Number</u>	<u>Title</u>
G-001	COVER
G-002	NOTES
G-103	EXISTING SITE PLAN
G-904	EXISTING SITE PHOTOS
C-101	WORK PLAN
C-102	DEMOLITION PLAN
C-503	DEMOLITION DETAILS
C-104	BID OPTIONS DEMOLITION PLAN
S-101	PIER PLAN
S-302	TYPICAL PIER SECTION 1
S-303	TYPICAL PIER SECTION 2
S-504	PIER DETAILS
S-505	PRECAST DECK PLANK DETAILS
S-506	MISCELLANEOUS DETAILS
S-507	FENDER DETAILS
S-108	BID OPTIONS DECK PLAN
S-509	REFERENCE DRAWING
P-101	SANITARY SEWER AND POTABLE WATER
P-502	SANITARY SEWER AND POTABLE WATER DETAILS
E-101	ELECTRICAL AND TELEPHONE SERVICE
E-502	ELECTRICAL AND TELEPHONE SERVICE DETAILS

1.13 REFERENCE DRAWINGS: The drawing listed below are included for reference only. They are known not to accurately reflect all existing conditions. Field verify all necessary information.

<u>Number</u>	<u>Title</u>
13-07239-S1	Title Sheet
13-07239-S2	Wharf Plan - Area West
13-07239-S3	Wharf Plan - Area East
13-07239-S4	Transverse Section at Grids 1-12
13-07239-S5	Transverse Section at Grids 13-25
13-07239-S6	Transverse Section at Grids 26-35
13-07239-S7	Transverse Section at Grids 36-45.5
13-07239-S8	Longitudinal Section at Grids AX-J
13-07239-S9	Longitudinal Section at Grids K-TB
13-07239-S10	Longitudinal Section at Grids AX-J
13-07239-S11	Longitudinal Section at Grids K-TB
13-07239-S12	Longitudinal Section at Grids AA-TB
13-07239-S13	Sections at Grids U-Y & Grids 46-49

<u>Number</u>	<u>Title</u>
13-S0914-G1	Title Sheet
13-S0914-G2	Symbols/Abbreviations/Legend
13-S0914-S1	General Notes and Abbreviations
13-S0914-S2	New Dolphin Plan
13-S0914-S3	Mooring Dolphin - Plan & Elevation
13-S0914-S4	Breasting Dolphin - Plan & Elevation
13-S0914-S5	Breasting Dolphin - Plan & Elevation
13-S0914-S6	Pier Repair - Elevations
13-S0914-S7	Pier Repair - Sections and Details
13-S0914-S8	Pier Repair Plan

<u>Number</u>	<u>Title</u>
13-02267TP-C1	Sanitary Sewer System
13-02267TP-C2	Site Water Plan
13-02267TP-C3	Electrical and Miscellaneous Utilities
13-02267TP-C4	Shore Tie Power Service

1.14 REFERENCE DOCUMENTS: The documents listed below are included for reference only.

- 1) "Final Geotechnical Report, Pier Improvements, U.S. Coast Guard, Tongue Point, Oregon," January 2002, by CH2Mhill.
- 2) "Geotechnical Assessment - 24-inch Steel Pipe Piles, Tongue Point Coast Guard Station," June 10, 2008, by Professional Service Industries, Inc., PSI Project No. 704-85072-3.
- 3) "401 Water Quality Certification for 2007 Nationwide Permit," U.S. Coast Guard.
- 4) "Vibration Monitoring Plan" included as part of permit submission by the Coast Guard to National Marine Fisheries, Habitat Conservation Commission.

Geotechnical data provided in the above reports is accurate only at the particular locations and time the subsurface

explorations were made. It is the Contractor's responsibility to make interpretations and draw conclusions based on the character of materials to be encountered and the impact on the work based on the Contractor's expert knowledge of the area and of pile installation techniques.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 GENERAL

- A. Forward all submittals to the Contracting Officer by e-mail within 10 calendar days from date of Notice to Proceed, unless indicated otherwise in the submittal register. Submittals shall be accompanied with the USCG furnished material submittal form in MS Word Format. Unless noted otherwise, all submittals shall be provided in an electronic image format. Provide these submittal images to the Contracting Officer, the Construction Manager, and the Contracting Officer's Representative (COR) simultaneously. If the electronic image is insufficient to ascertain submittal acceptability, the Contracting Officer may request a hard copy submittal. The Contracting Officer will e-mail approval or disapproval of submittals, within 14 calendar days after receipt. When e-mailing submittals, place the submittal ID number and the words "Tongue Point" in the subject field.
- B. The Construction Manager will review all submittals for compliance with these specifications. Submittals shall have been approved by the Contracting Officer before any item is delivered to the job site.
- C. Approval of submittals, and corrections or comments made during the review, do not relieve the Contractor from compliance with the requirements of the plans and specifications.
- D. The schedule of submittals listed in the submittal register and in the individual sections are the submittals required for this contract. Unsolicited submittals may be returned to the Contractor without review.

1.02 CATALOG CUTS: Catalog cuts shall contain manufacturer's description, specifications and sketches of the material and equipment provided. The catalog cut shall contain sufficient information, which can be used to determine compliance with these specifications.

1.03 CERTIFICATES OF COMPLIANCE: Certificates of compliance shall be signed by an authorized officer of the manufacturing company furnishing the material, which states that the material being furnished meets all requirements of these specifications and referenced specifications.

1.04 SAMPLES: Samples shall be submitted as described in the referencing specification section.

1.05 SHOP DRAWINGS: Drawings shall indicate layouts, dimensions, materials, and other information required to fully describe the items being installed. In addition to shop drawings for approval, submit one reproducible (vellum), full size, set of as-built shop drawings at completion of contract work. If

drawings are prepared using computer aided drafting, electronic files shall be compatible for use with AutoCAD 2005. Submit electronic files in addition to hard copy drawings.

- 1.06 STATEMENTS OF PROCEDURES: Job-specific detailed procedure statements for aspects of the project requiring special attention. The statements shall indicate all methods and materials to be used for proper execution of the work. The statements shall also indicate any limiting criteria and scheduling requirements.
- 1.07 STANDARD COMPLIANCE: When materials or equipment must conform to the standards of organizations such as the American Society for Testing and Materials (ASTM), and Underwriter's Laboratories (UL), proof of such conformance shall be submitted to the Construction Manager for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform the test. The certificate shall state that the item has been tested in accordance with the specified organization's standard.
- 1.08 TEST RESULTS: Submit test results as described in the individual referencing specification section.
- 1.09 PERMITS AND CERTIFICATES: Submit copies of all permits and certificates as described in the individual referencing specification section.
- 1.10 HAZARDOUS MATERIAL IDENTIFICATION: Submit Material Safety Data Sheets (MSDS) for any materials defined as hazardous under the most current revision of Federal Standard 313. One copy of each MSDS shall be submitted to the Contracting Officer's Representative no later than the delivery date of the product. Two copies shall be submitted to the Construction Manager.
- 1.11 AS-BUILT DRAWINGS: Maintain at the job site one set of specifications and one full size contract drawings marked in red to show any deviations which are found to exist or have been made from the contract drawings. Upon completion of the work, deliver the marked set of prints to the Contracting Officer. Request for final payment will not be approved until the marked prints are delivered to the Contracting Officer.
- 1.12 BAR CHART PROGRESS SCHEDULE: Within 10 calendar days after award, submit a bar chart progress schedule. On-site work shall not begin until a bar chart schedule has been approved. The bar chart shall show the complete sequence of construction by activity (including acquisition of materials and equipment). The chart shall identify the construction start date, the completion date, all workdays through the duration of the project. If the project requires various delivery dates, dates will be indicated for each of the required deliverable elements (i.e., housing unit or specific building). The bar chart shall also identify the cost for the various activities which shall

be used as the basis for the Contractor's periodic request for payments. Submission and approval of as-built drawings and O&M manuals shall each be separate line items (with associated costs) on the bar chart.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

PROJECT TITLE AND LOCATION:		PSN:	CONTRACT NO.:					
CEU OAKLAND SUBMITTAL REGISTER		526741						
USCG Tongue Point Facility, Astoria, Oregon		CONTRACTOR NAME:						
NO.	Submittal Reference Location		DATE REQUIRED Days after NTP	DATE SUBMITTED	ACTION DATE			REVIEWER
	SPEC SECTION	PARA.			DESCRIPTION OF SUBMITTAL	APPROVED	APPROVED AS NOTED	
001	01 33 00	1.01						
002	01 33 00	1.11						
003	01 33 00	1.12						
004	01 35 29	1.07						
005	01 35 29	1.07						
006	01 35 29	1.07						
007	01 35 29	1.07						
009	01 35 29	1.07						
010	02 41 00	1.04						
011	02 41 00	1.04						
012	02 41 00	1.04						
013	03 31 29	1.05						
014	03 31 29	1.05						
015	03 31 29	1.05						
016	03 31 29	1.05						
018	03 45 33	1.04						
019	03 45 33	1.04						
020	03 45 33	1.04						
021	03 45 33	1.04						
022	03 45 33	1.04						
023	05 12 00	1.05						
024	05 12 00	1.05						
025	05 12 00	1.06						

CEU OAKLAND SUBMITTAL REGISTER
 PSN: 526741
 CONTRACT NO.:

PROJECT TITLE AND LOCATION:
 USCG Tongue Point Facility,
 Astoria, Oregon
 CONTRACTOR NAME:

NO.	Submittal Reference Location		DESCRIPTION OF SUBMITTAL	DATE REQUIRED Days after NTP	DATE SUBMITTED	ACTION DATE			REVIEWER
	SECT SECTION	PARA.				APPROVED	APPROVED AS NOTED	DISAPPROVED	
026	09 97 13.26	1.03	PRODUCT DATA: EPOXY POLYAMIDE CERTIFICATES: EPOXY POLYAMIDE COATING						
027	09 97 13.26	1.03	SHOP DRAWINGS: PILE PLACEMENT PLAN						
028	31 62 16.16	1.03	PRODUCT DATA: DRIVING EQUIPMENT						
029	31 62 16.16	1.03	PRODUCT DATA: DRIVING HELMET						
030	31 62 16.16	1.03	PRODUCT DATA: PILE TIP DRIVING SHOES						
031	31 62 16.16	1.03	PRODUCT DATA: BUBBLE CURTAIN DESIGN DATA: PILE DRIVING DESIGN CALCULATIONS						
032	31 62 16.16	1.03	TEST REPORTS: DYNAMIC TESTING OF PILES						
033	31 62 16.16	1.03	CERTIFICATES: DRIVING EQUIPMENT						
034	31 62 16.16	1.03	CERTIFICATES: STEEL PIPE PILES						
035	31 62 16.16	1.03	RECORDS: PILE DRIVING RECORDS						
036	31 62 16.16	1.03	SHOP DRAWINGS: PLASTIC PILES						
037	31 62 21.10	1.03	PRODUCT DATA: DRIVING EQUIPMENT						
038	31 62 21.10	1.03	PRODUCT DATA: PLASTIC PILES						
039	31 62 21.10	1.03	RECORDS: PILE DRIVING RECORDS						
040	31 62 21.10	1.03	RECORDS: PILE DRIVING RECORDS						
041	31 62 21.10	1.03	RECORDS: PILE DRIVING RECORDS						

SECTION 01 35 29 – HEALTH, SAFETY, AND EMERGENCY RESPONSE
PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the health, safety, emergency response procedures, and environmental protection requirements listed herein and in accordance with the drawings.

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

A. ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATIONS:

40 CFR 262 Standards Applicable to Generators of Hazardous Waste

40 CFR 761 Polychlorinated Biphenyls (PCB) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

B. U.S. ARMY CORPS OF ENGINEERS (USACE):

EM 385-1-1 (2003) Safety - Safety and Health Requirements.

C. U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS:

29 CFR 1910.120 Hazardous Waste Operations

29 CFR 1926.59 Hazard Communication

29 CFR 1926.106 Working Over or Near Water

29 CFR 1926.501-503 Fall Protection

D. U. S. DEPARTMENT OF TRANSPORTATION REGULATIONS:

49 CFR 100-199 Hazardous Materials Transportation, Handling, and Storage Regulations

Clean Water Act (33 U.S.C. §§ 1251 to 1387)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. §§ 9601 to 9675)

Noise Control Act (NCA) (42 U.S.C. §§ 4901 to 4918)

Toxic Substance Control Act (TSCA) (15 U.S.C. §§ 2601 to 2654)

Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901 to 6991i)

1.04 HAZARDOUS MATERIAL TESTING:

- A. No tests have been conducted on the materials expected to be encountered during this work. The Contractor shall comply with the requirements of this specification in the event any materials are encountered which may pose a potential health hazard.

1.05 UNFORESEEN HAZARDOUS MATERIALS:

- A. If, during the course of work, unforeseen material is found that may be hazardous to human health upon disturbance during construction operations, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days, the Government will determine if the material is hazardous. If the material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If the material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a contract modification.

1.06 DEFINITIONS

- A. Sediment: Soil and other debris that has been eroded and transported by runoff water.
- B. Solid Waste: Rubbish, debris, and other discarded solid materials resulting from industrial, commercial, and agricultural operations, and from community activities. Solid waste may also include non-sewage liquids.
- C. Rubbish: A variety of combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.
- D. Debris: Includes combustible and noncombustible wastes, such as ashes, waste materials that result from construction or maintenance and repair work, leaves, and tree trimmings.
- E. Chemical Wastes: Includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

F. Sanitary Wastes:

- 1) Sewage: Wastes characterized as domestic sanitary sewage.
- 2) Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

G. Asbestos and Asbestos Materials: Asbestos means actinolite, amosite, antophyllite, chrysotile, crocidolite, and tremolite. Asbestos material means asbestos or any material containing asbestos such as asbestos waste, scrap, debris bags, containers, equipment, and asbestos-contaminated clothing consigned for disposal. Friable asbestos material means any material that contains more than one percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder, when dry, by hand pressure.

H. Oily Waste: Includes petroleum products and bituminous materials.

I. PCB (Polychlorinated Biphenyls): Toxic and non-biodegradable materials used extensively under trade names, such as Pyranol or Askarel, as insulating cooling fluids in capacitors and transformers.

J. Hazardous Material (HM): Chemicals defined by OSHA 29 CFR 1926.59 and under the U.S. Department of Transportation (DOT) regulations (Title 49 CFR Parts 100 through 199) which are determined by the Secretary of Transportation to present risks to safety, health, and property during transportation. The DOT regulations include requirements for shipping papers, package marking, labeling, transport vehicle placarding, and training of personnel handling hazardous materials.

K. Hazardous Substance: Substances defined under the Clean Water Act and CERCLA as chemicals, which are harmful to aquatic life or the environment and are regulated, if spilled or otherwise released to the environment. The EPA has designated "reportable quantities" for each hazardous substance (Table 40 CFR 302.4) under CERCLA. If an amount equal to or greater than the reportable quantity of a hazardous substance is released to the environment, that spill must be reported.

L. Hazardous Waste (HW): Substances, which are hazardous and have been discarded, are regulated as hazardous waste under RCRA or State Health and Safety Codes and their implementing regulations. A waste is hazardous if it meets certain levels of reactivity, ignitability, corrosivity, or toxicity, or is otherwise listed as a hazardous waste in Title 40 CFR Part 261 or in the respective State Health

and Safety Code or Code of Regulations.

- 1.07 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES":
- A. Solid Waste Disposal Permit: Upon disposal, provide copies of the acceptance receipts for the material, from the disposal site.
 - B. HW Manifests: Upon disposal of hazardous waste, submit a copy of the completed manifests within 5 calendar days of delivery of the wastes to the EPA approved treatment, storage and disposal facility.
 - C. HM/HW Handling Plan: Comply with all local, state, and federal laws and regulations when handling hazardous materials and disposing of and handling hazardous and other wastes. The Contractor shall have a compliance program outlining how the Contractor handles and disposes of hazardous materials, petroleum products, hazardous substances, and hazardous waste. The program shall include, but is not limited to, the following elements as appropriate: a general storage site plan, methods used to analyze whether generated material (blasting debris, paint waste, etc.) is hazardous, any hazardous waste licenses and permits, air district permits, and the identification of hazardous waste and material transportation and disposal Contractors. The Coast Guard has the right to require removal from the contract performance of any subcontractor who fails to comply with these laws and regulations or who fails to provide appropriate evidence of compliance with them.
 - D. Material Safety Data Sheets (MSDS's): Copies of all MSDS's for all hazardous materials (including petroleum products) shall be submitted along with a listing of quantities of these hazardous materials proposed to be stored on site.
 - E. Erosion Control and Temporary Drainage Plan: Indicate the measures to be used to protect land resources, and wildlife habitats. These measures must prevent visible or measurable erosion from leaving the construction site. Plan shall detail structures, location, and expected flow paths.
 - F. Site Specific Safety Plan: Provide a site-specific safety plan in accordance with U.S. Army Corps of Engineers EM 385-1-1. Safety plan shall address all safety hazards, both during demolition and during construction.
- 1.08 ENVIRONMENTAL PROTECTION REQUIREMENTS: Provide and maintain environmental protection during the life of the Contract to control pollution or to correct conditions that develop during construction. Comply with all Federal,

State, and local laws and regulations pertaining to water, air, soil, and noise pollution.

1.09 PROTECTION OF NATURAL RESOURCES

- A. Preserve the natural resources within the project boundaries and outside the limits of permanent work performed under this Contract in their existing condition or restore to an equivalent or improved condition upon completion of the work. Repair or restore to original condition all trees or other landscape features scarred or damaged by equipment or operations. Obtain Contracting Officer's approval before repair or restoration. Confine construction activities to areas defined by the work schedule, drawings, and specifications. Federal Acquisition Regulation clause 52.236-9 applies.
- B. Except in areas indicated to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without special written permission from the Contracting Officer. Protect existing trees, which may be damaged by construction operations.
- C. Construction equipment is to be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they shall be cleaned up immediately. Drip pans shall be utilized when vehicles are parked. Confine equipment maintenance and/or repair to one location. Control runoff in this area to prevent contamination of soils and water.
- D. At or before Contract completion, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and all other vestiges of construction. Temporary roads, parking areas, staging areas, and similar temporary use areas where excavation has been accomplished shall be graded in conformance with surrounding areas. Restore all disturbed areas to their original condition.
- E. Provide debris booms and silt curtains around limits of work during all phases of work.
 - 1) Float Debris Barriers shall be positioned to enclose the entire work area. Floating Debris Boom shall consist of:
 - (a) Floatation: 24" (61cm) long x 10.5" (27cm) high Solid Molded Closed Cell Polyethylene Foam or Fiberglass Shell with Urethane foam filled.
 - (b) Fabric: 175 oz./sq. yd. PVC coated Belting Material.

- (c) Freeboard: 8" to 12" above Water Surface.
- (d) Draft: 16" to 36" below Water Surface.
- (e) Ballast: 2 lbs. per foot of lead ballast weights securely riveted along the bottom edge.
- (f) Connectors: "Z" Type Quick Latch, Slickhitch to ASTM F-962 Standard with 3/8" Self-locking Toggle Pin and lanyard.
- (g) Extra Corrosion Protection: Hard Coat Sulfuric Anodized (per MIL Spec #: MIL-A-8625, Type II, Class 1) Aluminum.
- (h) Color: Flotation is International Orange with Orange Fabric.
- (i) Section: Standard 50 or 100 foot lengths.
- (j) Weight: 6 to 10 lbs./ft.

2) Silt curtain shall be positioned to enclose the work area to achieve turbidity abatement thresholds as monitored by turbidity meter. Silt curtain shall consist of:

- (a) Fabric - High strength nylon reinforced vinyl high visibility yellow 22 oz/yd² weight.
- (b) Connector - Snap hooks and rings connect load lines with slotted reinforced PVC pipe for fabric closure. *Optional extruded aluminum connectors.
- (c) Flotation-12" expanded polystyrene over 29lbs./Ft buoyancy.
- (d) Ballast - 5/16" galvanized chain (1.1 lbs/ft).
- (e) Load Lines - Dual 5/16" galvanized wire ropes with heavy vinyl coating.

F. Contractor shall monitor and record turbidity utilizing a turbidity meter during pile removal and installation operations. Monitoring shall occur each day during daylight hours when in-water work is being conducted and be in accordance with Oregon DEQ's 401 Water Quality Certification for 2007 Nationwide Permit Program.

G. Provide approved bubble curtain around steel pipe piles during pile driving operations. Adjust bubble curtain airflow or modify pile driving operations to maintain single strike peak (SPL = 206dB, cumulative SEL=187 dB (for fisher greater than 2 grams) and cumulative SEL= 183

dB (for fish less than 2 grams).

H. At a minimum, the bubble curtain shall consist of the following:

- 1) The bubble curtain system shall consist of one or more compressors capable of producing 100 psi minimum at 150 cfm. System shall include all necessary equipment including power source, primary and secondary feed lines, distribution manifold(s) with valves, bubbler manifolds, air pressure gauges and flow meters, appurtenant fittings and deployment gear.
- 2) The pile shall be completely engulfed in bubbles over the full depth of the water column at all times when an impact pile driver is in use. The radial dimension of the bubble curtain shall be no more than 2 feet from the outside surface of the pile.
- 3) Air shall be delivered from bubbler manifold assemblies ("bubblers") located on the river bottom and at intervals not exceeding 8 feet between the water surface and the river bottom with the last bubbler always resting on the river bottom.
- 4) Bubblers shall be adequately weighted and supported to hole position vertically and horizontally when operating and when not operating.
- 5) Bubblers shall be constructed of 2-inch (minimum) inside diameter pipe with 1/16" diameter bubble release holes. Bubble release holes shall be spaced approximately 3/4 inches apart (5 holes per 1 1/2"). Air holes with this size and spacing shall be placed in a minimum of four adjacent rows along the pipe to provide uniform bubble flux.
- 6) Bubblers shall be durable enough to withstand repeated use and shall be constructed to facilitate underwater setup, knockdown, and reuse on the next pile.
- 7) One or more compressors shall be provided to supply air in sufficient volume and pressure to self-purge water from the bubblers and maintain the required bubble flux for the duration of pile driving. Compressors shall be of a type that prevents the introduction of oil or fine oil mist by the compressed air into the water. The presence of oil film or sheen on the water surface in the vicinity of the operating bubbler will indicate that Contractor has failed to meet this requirement. Contractor shall immediately stop work until the source of oil film or sheen is identified and corrected.

- 8) Contractor shall monitor the flow and pressure to each bubbler and balance as necessary to maintain a constant, uniform air volume through each bubbler for the duration of pile driving. Airflow volume shall be distributed equally to all bubblers and uniformly over the length of each bubbler.
 - 9) Prior to first use of the air bubble curtain during pile driving, the fully assembled system shall be test-operated to demonstrate proper function and to train personnel in the proper balancing of the air flow to the bubblers.
- I. Contractor shall retain an underwater sound monitoring consultant acceptable to National Marine Fisheries Service to monitor and record underwater sound levels (hydroacoustic monitoring) during the first 10 representative piles. If the Contractor is able to demonstrate compliance when using the attenuation system (bubble curtain), no further monitoring will be required. If levels are not below the threshold, monitoring will continue until 10 consecutive piles are below the thresholds or until the project is complete. The Contractor will be responsible for determining the method of attenuation required to obtain these levels.
 - J. Underwater Sound Monitoring Consultants that have demonstrated to National Marine Fisheries Service that they are capable of meeting the necessary monitoring requirements are:

Illingworth & Rodkin
Attn: Keith Pommerenck
505 Petaluma Blvd. South
Petaluma, CA 94952
(707) 766-7700

Greenridge Sciences
Attn: Dr. Charles Green
1411 Firestone Rd.
Goleta, CA 93117
(805) 967-7720

Wilson Ihrig & Associates
Attn: Derek Watry
5776 Broadway
Oakland, CA 94618
(510) 658-6719
 - K. Pile driving shall be conducted during daylight hours only.
 - L. In water work, including demolition and pile driving, shall be conducted between 1 November and 28 February.

1.10 CONTROL AND DISPOSAL OF WASTES: With the exception of materials specifically indicated or specified to be salvaged for reuse in construction, or turned over to the Government, all wastes and demolished materials become the Contractor's property and shall be removed from the job site daily.

- A. Hazardous Waste Disposal: Any hazardous waste generated by work under this contract is the responsibility of the Contractor and shall be disposed of in accordance with all applicable federal, state, and local regulatory requirements. The facility is the generator of record and will provide the EPA ID number and manage manifests. The site environmental manager must approve and sign all manifests. The contractor may leave wastes on site pending analysis for disposal. The wastes will be accumulated at a location designated by the POC. The facility address will be used on each manifest. CEU Oakland shall not appear on any manifest. The Contractor shall arrange and be responsible for the transportation and final disposal of any hazardous waste. Comply with applicable parts of 40 CFR 262. Any manifest of hazardous waste shall be signed by the Government Hazardous Materials/Hazardous Waste Coordinator at the work site (hereinafter "HM/HW Coordinator"). The Contractor shall contact the HM/HW Coordinator for disposal of any hazardous waste. No Contractor or subcontractor shall have the authority to sign a hazardous waste manifest using the facility's EPA generator ID number. Only the HM/HW Coordinator may sign a manifest for hazardous waste.
- B. HM/HW Spill Response: Store chemical waste in corrosion resistant containers labeled to identify type of waste and date filled. Comply with 49 CFR 178. Remove containers from Government property and dispose of in accordance with Federal, State, and local regulations. Submit a certified copy of the acceptance receipts for these materials, indicating quantities. For oil and hazardous material spills which may be large enough to violate Federal, State, and local regulations, notify the Contracting Officer immediately.
- C. Dispose of petroleum products and petroleum contaminated soil and water in accordance with procedures meeting Federal, State, and local regulations. Comply with 40 CFR 761 for removal and disposal of PCB containing articles.
- D. Comply with 40 CFR 262 and 263, 29 CFR 1910.120, and state regulations for removal, transportation and disposal of hazardous waste as discussed in the Contractor's HM/HW Handling Plan.
- E. Coordinate use of sanitary, odor, and pest control systems with COR.

- 1.11 FALL PROTECTION: Per 29 CFR 1926.501-503, employees engaged in roofing activities on low slope roofs, with unprotected sides and edges 6 ft or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-ft or less in width, the use of a safety monitoring system alone (i.e., without the warning line system) is permitted.
- 1.12 DUST CONTROL: Keep dust down at all times, including non-working hours, weekends, and holidays. Sprinkle or treat with dust suppressors, haul roads, and other areas disturbed by operations. No dry power brooming is permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing is permitted only for cleaning nonparticulate debris, such as steel reinforcing bars. No sandblasting is permitted unless dust is confined. Only wet cutting of concrete blocks, concrete, and asphalt is permitted. No unnecessary shaking of bags is permitted where bagged cement, concrete mortar, and plaster is used.
- 1.13 NOISE: Make the maximum use of "low-noise-emission products" as certified by EPA and described at 40 CFR Part 204. No blasting or use of explosives is permitted. Comply with applicable portions of the Noise Control Act (NCA). The Contractor is responsible for complying with all other federal, state, and local noise control laws and regulations.
- 1.14 PIPE DISINFECTION: Disinfect any domestic water pipe prior to use. Fill new pipe with chlorine so the free available chlorine (FAC) level is no less than 50 ppm throughout. Verify by sampling the water. Let stand for 24 hours and sample. The sample taken after 24 hours shall show a FAC level of no less than 25 ppm. If the FAC level is less than 25 ppm, re-chlorinate to a FAC level of no less than 50 ppm and repeat the above procedures. If the FAC is 25 ppm or greater, flush pipes with domestic water until the chlorine residual is between 0.2 ppm to 0.5 ppm, or meets potable water standards as established by EPA. Sample and test using a certified testing laboratory. A minimum of two consecutive water samples taken no less than 24 hours apart shall be certified free of bacteria before water pipes can be used.
- 1.15 WORKING OVER OR NEAR WATER: When working over or near water, comply with 29 CFR 1926.106.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 41 00 – DEMOLITION

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the demolition requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of general demolition with at least five years experience.
- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- A. AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
- ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations
- B. U.S. ARMY CORPS OF ENGINEERS (USACE)
- EM 385-1-1 (2003) Safety - Safety and Health Requirements
- 1.03 GENERAL REQUIREMENTS: Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the work site daily; do not allow accumulations outside the work area. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible.
- 1.04 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES":
- A. Demolition Plan (Best Management Practices): Submit proposed demolition and removal procedures to the Contracting Officer for approval before work is started.

- B. Phasing Plan: Submit proposed phasing plan for providing uninterrupted service to the CGC Fir.
 - C. Utilities Plan: Submit proposed utilities temporary relocation, support and maintenance plan to the Contracting Officer for approval before work is started. Submit proposed final utilities location and configuration to the Contracting Officer for approval before work is started.
 - D. Receipts: Receipts as specified in Section 01 35 29, "HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES" paragraphs 1.07 and 1.10.
 - E. Accident Prevention Plan: As required by the USACE, "Safety and Health Requirements Manual".
- 1.05 REGULATORY AND SAFETY REQUIREMENTS: Comply with Federal, State, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ASSE/SAFE A10.6.
- 1.06 DUST AND DEBRIS CONTROL: Prevent the spread of dust and debris in accordance with Section 01 35 29, "HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES," and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris. A debris boom and silt fence shall be installed and maintained that encloses the pier area during demolition. Debris will be gathered daily and disposed of at an approved upland landfill.
- 1.07 PROTECTION
- A. Traffic Control Signs: Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.
 - B. Existing Conditions: Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for

increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

- C. Facilities: Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.
 - D. Personnel Protection: The Contractor shall provide barriers or overhead protection wherever work could cause injury to building occupants or other personnel in the area.
- 1.08 BURNING: The use of burning at the project site for the disposal of refuse and debris will not be permitted.
 - 1.09 REQUIRED DATA: Demolition plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a temporary relocation schedule of utility services, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations. The procedures shall provide for safe conduct of the work in accordance with EM 385-1-1. The Work Plan shall include a Debris Management Plan with well-detailed construction Best Management Practices (BMP's) to fully contain and control all construction debris produced during the duration of the contract work. It shall also include a description of in-place methodology to mitigate and clean-up any accidental debris spillage into the local aquatic environment.
 - 1.10 ENVIRONMENTAL PROTECTION: The work shall comply with the requirements of Section 01 35 29, "HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES."
 - 1.11 USE OF EXPLOSIVES: Use of explosives will not be permitted.

1.12 COORDINATION: Conduct demolition to minimize interference with adjacent facilities and Facility operations. Coordinate demolition activities with Facility's Point of Contact and the COR.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 DEMOLITION: Completely remove materials and items to be demolished in an orderly and careful manner. Protect adjacent areas and buildings from damage during demolition operations.

A. Limits of demolition are shown on the drawings.

3.02 DISPOSITION OF MATERIAL

A. Title to Materials: Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Items listed for Government salvage ("remove and store") are called-out on Drawing G-002. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

B. Reuse of Materials and Equipment: Removed materials are not to be reused on the site.

C. Debris Disposal: Contractor is responsible for the disposal of debris and materials to an approved upland disposal site.

3.03 CLEANUP: Debris and rubbish shall be removed from the work site. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

DIVISION 03 - CONCRETE

SECTION 03 31 29 – MARINE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the marine concrete requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of marine concrete construction with at least five years experience.

1.02 APPLICABLE PUBLICATIONS: 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.

A. ACI INTERNATIONAL (ACI)

ACI 117	(2006) Standard Tolerances for Concrete Construction and Materials & Commentary
ACI 121R	(2004) Quality Management System for Concrete Construction
ACI 201.2R	(2001) Guide to Durable Concrete
ACI 211.1	(1991; R 2002) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214R	(2002) Evaluation of Strength Test Results of Concrete
ACI 301	(1999) Specifications for Structural Concrete for Buildings
ACI 304.2R	(1996) Placing Concrete by Pumping Methods
ACI 304R	(2000) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(1999, Errata 2006) Hot Weather Concreting
ACI 306.1	(2002) Standard Specification for Cold Weather Concreting

- ACI 308 (2001) Guide to Curing Concrete
- ACI 309R (2005) Guide for Consolidation of Concrete
- ACI 311.4R (2005) Guide for Concrete Inspection
- ACI 318 (2008) Building Code Requirements for Structural Concrete and Commentary
- ACI 347 (2004) Guide to Formwork for Concrete
- ACI SP-15 (2005) Field Reference Manual: Standard Specifications for Structural Concrete with Selected ACI and ASTM References
- ACI SP-2 (2001) ACI Manual of Concrete Inspection
- ACI SP-66 (2004) ACI Detailing Manual
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
- AASHTO M 182 (1991; R 2000) Burlap Cloth Made from Jute or Kenaf
- C. U.S. ARMY CORPS OF ENGINEERS (USACE)
- COE CRD-C 61 (1989A) Test Method for Determining the Resistance of Freshly Mixed Concrete to Washing Out in Water
- D. ASTM INTERNATIONAL (ASTM)
- ASTM A 497 (2002) Steel Welded Wire Reinforcement, Deformed, for Concrete
- ASTM A 615/A 615M (2003a) Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- ASTM A 934/A 934M (2004) Epoxy-Coated Prefabricated Steel Reinforcing Bars
- ASTM C 1064 (1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
- ASTM C 1077 (2003a) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C 1260	(2001) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 143	(1998) Slump of Hydraulic Cement Concrete
ASTM C 171	(2003) Sheet Materials for Curing Concrete
ASTM C 172	(2004) Sampling Freshly Mixed Concrete
ASTM C 173	(1994ael) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 227	(2003) Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C 231	(2004) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 295	(2003) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(2003) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2003) Concrete Aggregates
ASTM C 39	(1993a) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1990) Obtaining and Testing Drilled Cores and Sawed Beam of Concrete
ASTM C 59	(1983; R 1991) Pulse Velocity Through Concrete
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 618	(2003) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 805	(2002) Rebound Number of Hardened Concrete
ASTM C 881	(1999) Epoxy-Resin-Base Bonding

Systems for Concrete

ASTM C 920	(2005) Standard Specification for Elastomeric Joint Sealants
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 989	(2004) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM D 1190	(1997) Standard Specification for Concrete Joint Sealer, Hot Applied Elastic Type
ASTM D 1751	(2004) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
ASTM D 1752	(2004) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 512	(2004) Chloride Ion in Water
ASTM D 516	(2002) Sulfate Ion in Water
ASTM E 329	(2003) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

E. STATE OF OREGON DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT	(2008) State of Oregon, Department of Transportation, Stnd. Specifications for Highway Construction
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1.03 MODIFICATION OF REFERENCES:

- A. Accomplish work in accordance with ODOT specifications and ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.
- B. ODOT: Where included in the ODOT specifications, replace the terms "Resident", "State", "Engineer", and "Department's Materials Laboratory" with "Contracting

Officer", unless otherwise specified as follows.

1.04 DEFINITIONS

- A. "Blending size" is an aggregate that complies with the quality requirements in ASTM C 33 and paragraph entitled "Aggregates" and as modified herein and can be blended with coarse and fine aggregate to produce a well graded combined grading.
- B. "Cementitious material" as used herein shall include Portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.
- C. "Design strength" (f'_c) is the specified compressive strength of concrete to meet structural design criteria.
- D. "Marine concrete" is that concrete that will be in contact with or subject to submersion, tidal variations, splash, spray, or ambient wetting from water in navigable waterways.
- E. "Mixture proportioning" is a description of the proportions of a concrete mixture that were selected to enable it to meet the performance durability requirements, constructability requirements, and the initial and life cycle cost goals.
- F. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- G. "Field test strength" (f_{cr}) is the required compressive strength of concrete to meet structural and durability criteria. Determine (f_{cr}) during mixture proportioning process.

1.05 SUBMITTALS: Submit the following in accordance with Section 01 33 00, SUBMITTAL PROCEDURES:

- A. Shop Drawings
 - 1) Reinforcing steel
 - 2) Formwork
 - 3) Construction Joints
 - 4) Contraction Joints

Reproductions of contract drawings are unacceptable.

- B. Product Data
 - 1) Material for curing concrete
 - 2) Joint sealants

- 3) Joint Filler (expansion material)
- 4) Epoxy bonding compound
- 5) Synthetic reinforcing fibers
- 6) Reinforcement supports
- 7) Epoxy resin for anchors
- 8) Bonding grout

C. Design Data

- 1) Mixture Design

D. Test Reports

- 1) Concrete mixture proportions
- 2) Fly ash
- 3) Natural pozzolan
- 4) Ground iron blast-furnace slag
- 5) Silica fume
- 6) Aggregates
- 7) Admixtures
- 8) Fiber-reinforced concrete
- 9) Cement
- 10) Water
- 11) Deformed bar reinforcement
- 12) Welded wire fabric

E. Certificates

- 1) Concrete curing elements
- 2) Concrete placement and compaction
- 3) Quality assurance
- 4) Field testing technician and testing agency
- 5) Mixture design reports
- 6) Delivery (Batch) tickets

1.06 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI 301 and ASTM A 934/A 934M for job site storage of materials. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

1.07 QUALITY ASSURANCE

- A. CONCRETE MIXTURE DESIGN: At least 30 days prior to concrete placement, submit proportions for a concrete mixture for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, aggregate, fly ash, (or slag pozzolans), silica fume, ground slag, synthetic fibers, corrosion inhibitors; and applicable reference specifications. Submit additional data regarding concrete

aggregates if the source of aggregate changes. Submittal shall clearly indicate where each mixture will be used when more than one mix design is submitted. An identical concrete mixture previously approved and used within the past 12 months by the ODOT may be used without further approval, if copies of the previous approval, location and aggregate, fly ash, silica fume, and pozzolan test results are submitted. The approval of aggregate, fly ash, silica fume, and pozzolan test results shall have been within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement. The mixture shall be prepared by an accredited laboratory experienced in this field and under the direction of a licensed/registered civil engineer, who shall sign all reports and designs.

B. DRAWINGS

- 1) Reinforcing Steel: ACI SP-66. Provide bending and cutting diagrams, assembly diagrams, splicing placement and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Only complete drawings will be accepted.
- 2) Formwork: ACI 347. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components. Indicate placement schedule, construction, and location and method of forming construction and contraction joints. Include locations of inserts, pipe work, conduit, sleeves, and other embedded items. Furnish drawings and descriptions of shoring and reshoring methods proposed for slabs, beams, and other horizontal concrete members.

C. CERTIFICATES

- 1) Curing Concrete Elements
 - (a) Submit proposed materials and methods for curing concrete elements.
- 2) Concrete Placement and Compaction
 - (a) Submit technical literature for equipment and methods proposed for use in placing concrete. Include pumping or conveying equipment including type, size and material for pipe, valve characteristics, 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 concrete. 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.

3) Quality Assurance

- (a) Develop and submit for approval a quality control plan in accordance with the guidelines of ACI 121R and as specified herein. The plan shall include plans for the concrete supplier, the reinforcing steel supplier, and installer. Maintain a copy of ACI SP-15 and CRSI Manual of Practice at the project site.

4) Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing any work.

- (a) Work on concrete under this contract shall be performed by an ACI Concrete Field Testing Technician Grade 1 or Grade 2 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI SP-2.
- (b) Testing agencies that perform testing services on reinforcing steel shall meet the requirements of ASTM E 329.
- (c) Testing agencies that perform testing services on concrete materials shall meet the requirements of ASTM C 1077.

5) Mixture Design Reports

- (a) Provide a detailed report of materials and methods used, test results, and the field test strength (fcr) for marine concrete required to meet durability requirements.

D. TEST REPORTS

- 1) Concrete Mix Proportions: ASTM C1077. See ODOT 02001.
- 2) Fly Ash and Natural Pozzolan: ASTM C618. See

ODOT 02030.10.

- 3) Ground Iron Blast-Furnace Slag: ASTM C989. See ODOT 02030.40.
- 4) Silica Fume: ASTM C1240. See ODOT 02030.20.
- 5) Aggregates: ASTM C33 for aggregate quality and gradation curves; ASTM C295 for petrographic examinations; ASTM C227 or C1260 where there is potential for alkali-silica reaction. See ODOT 02690.
- 6) Admixtures: ASTM C494 and ASTM C1017 for concrete admixtures; and ASTM C260 for air-entraining agents. See ODOT 02040.
- 7) Fiber-Reinforced Concrete: ASTM C1116 for testing flexural toughness index I5.
- 8) Cement: ASTM C150 for Portland cement; ASTM C595 and ASTM C1157 for blended cements. See ODOT 02010.
- 9) Water: ASTM D512 and ASTM D516. See ODOT 02020.
- 10) Deformed Bar Reinforcement: ASTM A934. See ODOT 02510.10.
- 11) Welded Wire Reinforcement: ASTM A497. See ODOT 02510.40.

PART 2 PRODUCTS

2.01 CONCRETE

A. Concrete Mixture Design

- 1) All materials including cementitious components, aggregates, admixtures, and water shall be in accordance with ODOT 00540 and 02001 for Concrete Class 5000 for curbs; concrete class 4350 for deck overlay.
- 2) Alkali-Silica Reactivity: Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C1260. Test both coarse aggregate size groups if from different sources. Evaluate the fine and coarse aggregates separately and in combination, which matches the Contractor's proposed mix design proportioning, utilizing the modified version of ASTM C1260. Test results of the combination must have a measured expansion equal to or less than 0.08 percent at 16 days after casting.
- 3) The shrinkage of concrete at 28 days age should not

exceed 500 microstrains (0.05%) and at one year should not exceed 1200 microstrains (0.12%) as evaluated by ASTM C-157.

- 4) Coarse Aggregate: Maximum size of 3/4".
- 5) Cement: Type II Portland Cement per ASTM C150.

B. Deformed Bar Reinforcement

- 1) ASTM A615, Grade 60. See ODOT 02510.10.

C. Welded Wire Reinforcement

- 1) ASTM A497, Grade 60. See ODOT 02510.40.

D. Fiber Reinforced Concrete: Synthetic fibrous reinforcement shall be used in the deck overlay and shall comply with the following fiber characteristics:

- 1) Configuration: Fibers shall be a twisted-bundle network fiber system.
- 2) Chemistry: Fiber shall be made of 100% virgin polypropylene, white or gray in color.
- 3) Contents: Fibers shall be used at a dosage rate recommended by the manufacturer for application with overlays, but not outside the range of 0.1 percent to 2.0 percent by volume of concrete.
- 4) Length: Fiber length shall be 0.75 in. (min.) and 1.5 in. (max.).
- 5) Tensile Strength: Fiber tensile strength shall be 70 ksi (min.).
- 6) Compliance: Fibers shall comply with ASTM C1116. Products that are considered meeting these requirements include, but are not limited to the following:
 - a FORTA FERRO fiber
www.fortacorp.com
T 800-245-0306
 - b Nycon XL fiber
www.nycon.com
T 800-456-9266
 - c PSI Fibrillated fiber
www.psiconcretefibers.com
T 800-858-5671

2.02 Materials for Curing Concrete

- A. Impervious Sheeting: ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.
- B. Pervious Sheeting: AASHTO M 182.
- C. Liquid Membrane-Forming Compound: ASTM C 309, white-pigmented, Type 2, Class B.

2.03 Expansion Joint Filler: ASTM D 1751 or ASTM D 1752, 0.5 in. thick, and in accordance with ODOT 02440.10.

2.04 Joint Sealants

- A. Horizontal Surfaces, 3 Percent Slope, Maximum:
 - 1) ASTM D 1190 or ASTM C 920, Type M, Class 25, Use T. In accordance with ODOT 02440.11.
- B. Vertical Surfaces Greater Than 3 Percent Slope:
 - 1) ASTM C 920, Type M, Grade NS, Class 25, Use T. In accordance with ODOT 02440.11.

2.05 Epoxy Resin for Anchors: ASTM C 881. See ODOT 00535.10.

PART 3 EXECUTION

3.01 PREPARATION FOR PLACING: Before commencing placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probably, equipment and material shall be at the placing site to provide windbreaks, shading fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.02 FORMS

ACI 301. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated.

Provide formwork with clean-out openings to permit inspection and removal of debris. Formwork shall be gasketed or otherwise rendered sufficiently tight to prevent leakage of paste or grout under heavy, high-frequency vibration. Use a release agent that does not cause surface dusting. Limit reuse of plywood to no more than three times. Reuse may be further limited by the Contracting Officer if it is found that the pores of the plywood are clogged with paste to the degree that the wood does not absorb the air or the high water-cementitious materials ratio concrete surface.

Patch form tie holes with a nonshrink patching material in accordance with the manufacturer's recommendations and subject to approval.

- A. Coating: Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.
- B. Removal of Forms and Supports: After placing concrete, forms shall remain in place for the time periods specified in ACI 347. Prevent concrete damage during form removal.
 - 1) Special Requirements for Reduced Time Period: Forms may be removed earlier than specified if ASTM C 39 test results of field-cured samples from a representative portion of the structure or other approved and calibrated non-destructive testing techniques show that the concrete has reached a minimum of 85 percent of the design strength.
- C. Reshoring: 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. Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, slabs and beams over 10 feet in span and cantilevers over 4 feet shall be reshored for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Reshoring elements shall have the same load-carry capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

- 3.03 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS: ACI 301. Remove rust, scale, oil, grease, clay, or foreign substances from reinforcing that would reduce the epoxy coating bond from reinforcing. Do not tack weld. Inspect placed steel reinforcing for coating damage prior to placing concrete. Repair all visible damage.
- A. Reinforcement Supports: Place reinforcement and secure with plastic chairs, spacers, or plastic hangers (no steel within three inches of any exposed surface). Support reinforcement on the ground with plastic chairs on concrete or other noncorrodible material, having a compressive strength equal to or greater than the concrete being placed.
 - B. Splicing: As indicated. For splices not indicated, ACI 301. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches. AWS D1.4. Welded splices shall be approved prior to use.
 - C. Cover: Concrete cover for reinforcement shall be three inches to reinforcing bars unless otherwise noted. Placement tolerance is plus 1/4 inch.
 - D. Setting Anchor Bolts and Miscellaneous Material: Place and secure anchors, bolts, pipe sleeves, conduits, and other such items in position before placement of the concrete curb and curb bump-outs. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete. Anchorages located atop the overlay shall have their anchor bolts installed into the precast deck planks prior to placement of the overlay. Anchor bolt projections shall accommodate overlay thickness at the specified location.
 - E. Construction Joints: Place joints at locations shown on the Contract Drawings. Continue reinforcement across joints unless otherwise indicated.
 - F. Contraction and Isolation Joints: Provide joints as shown on the drawings. Make joints 0.5 inches wide unless indicated otherwise. Completely fill joints exposed to weather with joint filler material and joint sealant. Cut contraction joints to the indicated depth after the surface has been finished. Sawed joints shall be completed within 4 to 12 hours after concrete is finished and has sufficiently hardened. Protect joints from intrusion of foreign matter.
- 3.04 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE: ASTM C 94/C 94M, ACI 301, and ACI 304R, except as modified herein. Batching equipment shall be such that the

concrete ingredients are consistently measured within the following tolerances: 1 per cent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory delivery (batch) tickets imprinted with mix identification, batch size, batch design and measured weights, moisture in the aggregates, and time batched for each load of ready mix concrete. When a pozzolan is batched cumulatively with the cement, it shall be batched after the cement has entered the weight hopper.

- A. Measuring: Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

Adjust batch proportions to replicate the mixture design using methods provided in the approved quality assurance plan. Base the adjustments on results of tests of materials at the batch plant for use in the work. Maintain a full record of adjustments and the basis for each.

- B. Mixing: ASTM C 94 and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, if both the specified maximum slump and water-cementitious material ratio are not exceeded. When water is added, an additional 30 revolutions of the mixer at mixing speed is required. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.
- C. Transporting: Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

- 3.05 PLACING CONCRETE: Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt,

construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other or lifts for vertical construction. Position grade stakes on 10-foot centers maximum in each direction when pouring interior slabs and on 20-foot centers maximum for exterior slabs.

- A. Vibration: Comply with the requirements of ACI 309R and ASTM A 934/A 934M using vibrators with a minimum frequency of 9000 vibrations per minute (VPM). Use only high cycle or high frequency vibrators. Motor-in-head 60 cycle vibrators may not be used. For walls and deep beams, use a minimum of two vibrators with the first to melt down the mixture and the second to thoroughly consolidate the mass. Provide a spare vibrator at the casting site whenever concrete is placed. Place concrete in 18 inch maximum vertical lifts. Insert and withdraw vibrators approximately 18 inches apart. Penetrate at least 8 inches into the previously placed lift with the vibrator when more than one lift is required. Extract the vibrator using a series of up and down motions to drive the trapped air out of the concrete and from between the concrete and the forms.

For slab construction use vibrating screeds designed to consolidate the full depth of the concrete. Where beams and slabs intersect, use an internal vibrator to consolidate the beam. Do not vibrate concrete placed with anti-washout admixtures. Vibrators shall be equipped with rubber vibrator heads.

- B. Application of Bonding Grout: Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is tacky. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with bonding grouts.
- C. Pumping: ACI 304R and ACI 304.2R. Pumping shall not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment shall not exceed 2 inches. Do not use pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Take samples for testing at both the point of delivery to the pump and at the discharge end.
- D. Cold Weather: ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F. Obtain

approval prior to placing concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

- E. Hot Weather: ACI 305R. Maintain required concrete 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 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.06 SURFACE FINISHES, EXCEPT FLOOR, SLAB, AND PAVEMENT

- A. Defects: Repair formed surfaces by removing minor honeycombs, pits greater than 1 sq. in. surface area or 0.25 in. maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise indicated.
- B. Not Against Forms (Top Surfaces): Finish surfaces not otherwise specified with wood floats to even surfaces, and match adjacent finishes.

C. Formed Surfaces

- 1) Tolerances: ACI 117 and as indicated.
- 2) As-Cast Rough Form: Provide for surfaces not exposed to public view. Patch holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.
- 3) As-Cast Form: Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Patch tie holes and defects and completely remove fins.

3.07 FINISHES FOR HORIZONTAL CONCRETE SURFACES

- A. Finish: ACI 301. Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.
- 1) Floated: Exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation.
 - 2) Concrete Containing Silica Fume: Finish using magnesium floats or darbies.
 - 3) Broomed: All deck surfaces. Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.
 - 4) Concrete Toppings Placement: ACI 301. The following requirements apply to the placement of toppings of concrete on concrete surfaces that are either freshly placed and still plastic, or on hardened base slabs.

- (a) Bonding to a Hardened Concrete: When the topping is to be bonded to a floated or troweled hardened base, roughen the base by scarifying, grit-blasting, scabbling, planing, flame cleaning, or acid-etching to lightly expose aggregate and provide a bonding surface. Remove dirt, laitance, and loose aggregate by means of a stiff wire broom. Keep the clean base wet for a period of 12 hours preceding the application of the topping. Remove excess water and apply a 1:1:1/2 cement-sand-water grout, and brush into the surface of the base slab. Do not allow the bonding grout to dry, and spread it only short distances a head of the topping placement. Do not allow the temperature differential between the completed base and the topping mixture to exceed 10 degrees F at the time of placing. Place the topping and finish as indicated.

3.08 CURING AND PROTECTION

ACI 301 and ACI 308 unless otherwise specified. Prevent concrete from drying by misting surface of concrete. Begin curing immediately following final set. Avoid damage to concrete 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 from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. For concrete slabs or wide beams containing silica fume, fog spray and install wind breaks to ensure 100 percent relative humidity until wet curing is started.

Wet cure marine concrete using potable water for a minimum of 7 days. 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.

A. Moist Curing: Remove water without erosion or damage to the structure.

- 1) Ponding or Immersion: Continually immerse the concrete

throughout the curing period. Water shall not be 20 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

2) 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) Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 in. 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 nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

4) Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 in. minimum. Provide sheeting not less than 18 in. wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap vertical elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

B. Curing Periods: Moist cure concrete using potable water for a minimum of 7 days. Continue additional curing for a total period of 21 days. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Contracting Officer.

3.09 FIELD QUALITY CONTROL

A. Evaluation of Mixture Designs:

1) Test the fresh concrete as follows:

(a) Slump in accordance with ASTM C 143.

(b) Air content in accordance with ASTM C 231 or ASTM C 173.

- (c) Unit weight in accordance with ASTM C 138.
 - (d) For strength, cast 6 by 12 inch cylinders in accordance with ASTM C 31.
- 2) Test 6 by 12 inch cylinders cast under subparagraph above as follows:
- (a) Measure and weigh each specimen to determine unit weight as they are stripped from the molds.
 - (b) Test specimens to be tested at each age for pulse velocity through concrete in accordance with ASTM C 597.
 - (c) Two at each age of 24 hours and 3 and 7 days in accordance with ASTM C 39.
 - (d) Three at age of 28 and 90 days in accordance with ASTM C 39/C 39M.
 - (e) Two at each age of 28 and 90 days in accordance with ASTM C 496.
 - (f) Three cores: Resistance to chloride ion penetration in accordance with ASTM C 1202.
 - (g) Compressive strength in accordance with ASTM C 39.
 - Two cores at 24 hours
 - One core at 3 days
 - Two cores at 7 days
 - Three cores at 28 days
- 3) Sampling and determination of water soluble chloride ion content in accordance with ASTM C 1218/C 1218M. Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits of Table 5 below.
- 4) Sampling and determination of chloride ion penetration (ponding test) in accordance with AASHTO T 259.

Table 5 - Maximum Chloride Ion Content for Corrosion Protection

Type of Member	Maximum water soluble chloride ion (Cl) in concrete, percent by weight of cement
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.08
Reinforced concrete that will be dry or protected from moisture in service	0.15
Other reinforced concrete construction	0.30

5) Submit test results for evaluation and acceptance.

B. Sampling

- 1) ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31 for making test specimens.
- 2) Sample concrete on a random basis except where a batch appears to be deficient and the test can be used to verify the observed deviation. Identify samples so taken in a manner that they can be segmented from other tests. Obtain at least one sample for each 100 cubic yards, or fraction thereof, of each design mixture of concrete placed in any one day. When the total quantity of concrete with a given design mixture is less than 50 cubic yards, the strength tests may be waived by the Contracting Officer, if in his judgment, adequate evidence of satisfactory strength is provided.

C. Testing

- 1) Slump Tests: ASTM C 143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved high range water reducing (HRWR) admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.
- 2) Temperature Tests
 - (a) 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, until the specified temperature is obtained, and whenever test

cylinders and slump tests are made.

- (b) Determine temperature of each composite sample in accordance with ASTM C 1064. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40 degrees F for more than 3 successive days, concrete shall be delivered to meet the following minimum temperature at the time of placement:
 - (1) 55 degrees F for sections less than 12 in. in the least dimension
 - (2) 50 degrees F for sections 12 to 36 in. in the least dimension
 - (3) 45 degrees F for sections 36 to 72 in. in the least dimension
 - (4) 40 degrees F for sections greater than 72 in. in the least dimension
 - (c) The minimum requirements may be terminated when temperatures above 50 degrees F occur during more than half of any 24 hour duration. The temperature of concrete at time of placement shall not exceed 90 degrees F.
- 3) Compressive Strength Tests: ACI 214R tests for strength - conduct strength tests of concrete during construction in accordance with the following procedures:
- (a) Mold and cure six 6 by 12 in. cylinders from each sample taken in accordance with ASTM C 31/C 31M. Prevent evaporation and loss of water from the specimen.
 - (b) Test cylinders in accordance with ASTM C 39. Test one cylinder at 3 days, two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result. If both specimens in a test show any defects, the Contracting Officer may allow the entire test to be discarded.
 - (c) If the average of any three consecutive strength test results is less than the specified strength

(f'c) or the minimum test strength (fcr) for durability, whichever is higher, by more than 500 psi, take a minimum of three core samples in accordance with ASTM C 42, from the in-place work represented by the low test results. Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

(d) Strength test reports shall include location in the work where the batch represented by a test was deposited, batch ticket number, time batched and sampled, slump, air content (where specified), mixture and ambient temperature, unit weight, and water added on the job. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing.

(e) Final reports shall be provided within 7 days of test completion.

4) Air Content: ASTM C 173 or ASTM C 231 for normal weight concrete. Where concrete will be exposed to de-icing salts as indicated. Make air content tests on samples from the first three batches in the placement and until three consecutive batches have air contents within the range of the specified air content, at which time test every fifth batch. Maintain this test frequency until a batch is not within the specified range at which time resume testing of each batch until three consecutive batches have air contents within the specified range. Perform additional tests as necessary for control. Take air content tests from planned composite samples or from samples taken in accordance with ASTM C 172 at the point of concrete placement.

D. Non-Destructive Tests: Non-destructive tests - use of the rebound hammer in accordance with ASTM C 805, ASTM C 59/C 59M7, or other non-destructive processes may be permitted by the Contracting Officer in evaluating the uniformity and relative concrete strength in place, or for selecting areas to be cored.

Evaluate and validate test results conducted on properly calibrated equipment in accordance with standard ASTM procedures indicated.

E. Acceptance of Concrete Strength

1) Standard Molded and Cured Strength Specimens: When the averages of all sets of three consecutive compressive strength test results equal or exceed the design

compressive strength ($f'c$) or the required field test strength (fcr) whichever is higher, and no individual strength test falls below the specified compressive strength ($f'c$) or the required field durability strength (fcr) by more than 500 psi, whichever is higher. These criteria also apply when accelerated strength testing is specified unless another basis for acceptance is specified.

- 2) Non-Destructive Tests: Non-destructive tests may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria.
- 3) Core Tests: When the average compressive strengths of the representative cores are equal to at least 85 percent of the design strength ($f'c$) or the required average test strength (fcr), whichever is higher, and if no single core is less than 75 percent of the specified strength ($f'c$) or the required average field test strength (fcr), whichever is higher, strength of concrete is satisfactory.

Obtain and test cores in accordance with ASTM C 42. If concrete in the structure is dry under service conditions, air-dry cores (temperature 60 to 80 degrees F, relative humidity less than 60 percent) for 7 days before testing and test dry. If concrete in the structure will be more than superficially wet under service conditions, test the cores, after moisture conditioning, in accordance with ASTM C 42.

Take at least three representative cores from each member or area of concrete in place that is considered potentially deficient. Impair the strength of the structure as little as possible. If, before testing, cores show evidence of having been damaged subsequent to or during removal from the structure, take replacement cores.

Fill core holes with low slump concrete or mortar of a strength equal to or greater than the original concrete.

The Contracting Officer will evaluate and validate core tests in accordance with the specified procedures. Before testing in compression, test each core to determine pulse velocity through concrete in accordance with ASTM C 59/C 59M7. Correlate pulse velocity of concrete cores with pulse velocity of in-place concrete.

- F. Inspection: ACI 311.4R. Inspect concrete placed under water with qualified engineer/divers.

- 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. Pressure washing is not permitted.
- 3.11 DUST CONTROL: Control dust resulting from the work to prevent the spread of dust and avoid creation of a nuisance in the surrounding area. Do not use water when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, or pollution.
- 3.12 PROTECTION PRIOR TO ACCEPTANCE: Do not permit vehicular or heavy equipment traffic on the constructed surfaces. 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 construction during inclement weather, maintain such protective measures until the concrete has cured and discontinuance of the measures is authorized.

END OF SECTION

SECTION 03 45 33 – PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the precast structural concrete requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of precast structural concrete construction with at least five years experience.

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

A. ACI INTERNATIONAL (ACI)

ACI 304R	(2000) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(1999; Errata 2006) Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 309R	(2005) Guide for Consolidation of Concrete
ACI 318/318R	(2005; Errata 2005) Building Code Requirements for Structural Concrete and Commentary

B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 259	(2002; R2006) Resistance of Concrete to Chloride Ion Penetration
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C. AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2006; Errata 2006) Structural Welding Code - Steel
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- AWS D1.4 (2005; Errata 2005) Structural Welding Code - Reinforcing Steel
- D. ASTM INTERNATIONAL (ASTM)
- ASTM A 320 (1993) Alloy Steel Bolting Materials for Low-Temperature Service
- ASTM A 36/A 36M (2005) Carbon Structural Steel
- ASTM C 150 (2007) Standard Specification for Portland Cement
- ASTM A 615/A 615M (2007) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- ASTM C 1202 (2007) Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- ASTM C 1218/C 1218M (1999) Water-Soluble Chloride in Mortar and Concrete
- ASTM C 1260 (2007) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
- ASTM C 94/C 94M (2007) Ready-Mixed Concrete
- E. PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)
- PCI MNL-116 (1999) Quality Control for Plants and Production of Structural Precast Concrete Products
- PCI MNL-120 (2004) Design Handbook - Precast and Prestressed Concrete
- F. STATE OF OREGON DEPARTMENT OF TRANSPORTATION (ODOT) STANDARD (SSS)
- ODOT State of Oregon, Department of Transportation, Standard Specifications for Highway Construction

G. MODIFICATION OF REFERENCES:

- 1) Accomplish work in accordance with ACI, PCI and ODOT publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.
- 2) ODOT: Where included in the ODOT specifications, interpret reference to the "Resident", "State", "Engineer", "Department" and "Department's Materials Laboratory" to mean "Contracting Officer".

1.03 SYSTEM DESCRIPTION: The work includes the provision of precast, non-prestressed and precast, prestressed concrete herein referred to as precast members. Precast members shall be the product of a manufacturer specializing in the production of precast and prestressed concrete members as applicable.

A. Design Requirements: Design precast members in accordance with ACI 318/318R, PCI MNL-120 and ODOT 00550.03. Design precast members (including connections) for the design load conditions and spans indicated, and handling and erection stresses, and for additional loads imposed by openings and supports of the work of other trades. Design precast members for handling without cracking in accordance with the PCI MNL-120. Concrete overlay shall not be used in establishing the design strength of the precast members.

- 1) Loads: Loadings for members and connections shall include all dead load, live load, and applicable construction loads such as handling, erection loads, and other applicable loads.
- 2) Drawing and Design Calculation Information: Submit drawings and design calculations of precast members indicating complete information for the fabrication, handling, and erection of the precast member. Drawings shall not be reproductions of contract drawings. Design calculations and drawings of precast members (including connections) shall be made by a registered professional engineer experienced in the design of precast concrete members and registered in the state where the project is located, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:
 - (a) Plans, elevations and other drawing views showing the following:

- (1) Member piece marks locating and defining products furnished by the manufacturer
 - (2) Location and size of openings that require the location of prestressing strands to miss field cut openings
 - (3) Erection sequences and handling requirements
 - (4) Areas receiving overlay and magnitude of overlay thickness
 - (5) Lifting and erection inserts
- (b) Elevations, sections and other details for each member showing the following:
- (1) Connections between members and connections between members and other construction
 - (2) Connections for work of other trades and cast-in items and their relation to other trades
 - (3) Dimensioned size and shape for each member with quantities, position and other details of reinforcing steel, prestressing strand, anchors, inserts and other embedded items
 - (4) Lifting, erection and other handling devices and inserts
 - (5) Surface finishes of each member
 - (6) Estimated cambers
- (c) Magnitude, schedule and sequence of tensioning and detensioning prestressing strand.
- (d) Strength properties for concrete, steel and other materials.
- (e) Methods for storage and transportation.
- (f) Description of loose, cast-in and field hardware.
- (g) All dead, live, handling, erection and other applicable loads used in the design.

1.04 SUBMITTALS: Submit the following in accordance with Section 01 33 00, SUBMITTAL PROCEDURES:

- A. Shop Drawings
 - 1) Drawings of precast members
- B. Product Data
 - 1) Anchorage and lifting inserts and devices
 - 2) Bearing pads
 - (a) Submit manufacturer's literature from suppliers that demonstrates compliance with applicable specifications for the above materials.
- C. Design Data
 - 1) Precast members design calculations
 - 2) Concrete proportions
 - (a) Submit mixture proportioning and test results.
- D. Test Reports
 - 1) Concrete mix materials and design
 - (a) Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cement, silica fume, aggregates, and admixtures. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Test reports shall be submitted along with the concrete mix design. Obtain approval before concrete placement.
 - 2) Plastic concrete test results
 - 3) Hardened concrete test results
- E. Certificates
 - 1) Quality control procedures
 - (a) Submit quality control procedures established in accordance with PCI MNL-116 by the precast manufacturer.
 - 2) Construction Records
 - (a) Construction records of the manufacturing,

handling, and erection of the precast concrete members shall be submitted.

F. Closeout Submittals

- 1) Concrete batch ticket information

1.05 QUALITY ASSURANCE

A. Qualifications

- 1) Manufacturer Qualifications: PCI MNL-116. Plants shall be certified by the PCI Plant Certification Program for Category B1, B3, C1, or C3 work, as applicable. At the Contracting Officer's option, PCI Plant quality control program records shall be available for review.
- 2) Designer Qualifications: The designer shall be a registered professional engineer in the state where the project is located and experienced in the design of precast concrete and precast prestressed concrete, as applicable.
- 3) Erector Qualifications: The erector shall be regularly engaged for at least five years in the erection of precast (prestressed) structural concrete similar to the requirements of this project.
- 4) Welding Qualifications: Provide AWS D1.1/D1.1M qualified welders who are currently certified at contract award date and have maintained their certificates over the past year.

B. Regulatory Requirements: Provide precast members in conformance with ACI 318/318R and AWS D1.4.

C. Concrete Proportions: Submit in accordance with ODOT 00550.

D. Certificates: Record Requirement: ASTM C 94/C 94M. Submit mandatory batch ticket information for each load of ready-mixed concrete.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transportation

- 1) Transporting Members: In transporting members by truck, railroad car, or barge, provision shall be made for supporting the members as described below, except battens can be continuous over more than one stack of units, with adequate bracing to ensure their maintaining the vertical position and damping of dangerous vibrations. Trucks with double bolsters are

satisfactory provided the members are fully seated on the outer bolsters at not more than 3 ft or the depth of the member from the end and the inner bolster is not more than 8 ft from the end of the member or the designated pickup point. Adequate padding material shall be provided between tie chains or cables to preclude chipping of concrete.

(a) Lateral Deflection or Vibration: Any noticeable indication of lateral deflection or vibration during transportation shall be corrected by rigid bracing between members or by means of lateral trussing.

B. Storage

1) Storage Areas: Storage areas for precast members shall be stabilized, and suitable foundations shall be provided, so differential settlement or twisting of members will not occur.

2) Stacked members: Stacked members shall be separated and supported by battens placed across the full width of each bearing point. Battens shall be arranged in vertical planes at a distance not greater than the depth of the member from designated pickup points. Battens shall not be continuous over more than one stack of precast units. Stacking of members shall be such that lifting devices will be accessible and undamaged. The upper members of a stacked tier shall not be used as storage areas for shorter members or equipment.

C. Handling of Members: The location of pickup points for handling of the members and details of the pickup devices shall be shown in shop drawings. Members shall be handled only by means of approved devices at designated locations. Members shall be maintained in an upright position at all times and picked up and supported as shown in approved shop drawings.

PART 2 PRODUCTS

2.01 MIX DESIGN: ACI 318/318R. In accordance with ODOT 00550 for Concrete Class 5000, air entrained.

2.02 MATERIALS

A. Concrete Mixture: All materials, including cementitious, aggregates, admixtures, and water, shall be in accordance with ODOT 00550, are entrained. Cement shall be Type II Portland Cement per ASTM C150.

B. Alkali-Silica Reactivity: Evaluate and test fine and

coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C 1260. Test both coarse aggregate size groups if from different sources. Evaluate the fine and coarse aggregates separately and in combination, which matches the Contractor's proposed mix design proportioning, utilizing the modified version of ASTM C 1260. Test results of the combination must have a measured expansion equal to or less than 0.08 percent at 16 days after casting.

- C. Keyway Grout: Nonshrink grout in accordance with ODOT 00550.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 in accordance with ODOT 02510.10.
- E. Prestressing Strand: Uncoated, 7-wire strand, stress relieved, ASTM A 416/A 416 M, Grade 270 in accordance with ODOT 02515.10.
- F. Tie Rods: High strength tie rods, ASTM A 449 in accordance with ODOT 00550
- G. Metal Accessories: As indicated.
 - 1) Inserts: ASTM A 615/A 615M, Grade 60
 - 2) Structural Steel: ASTM A 36/A 36M.
 - 3) Bolts, Nuts and Washers: ASTM A307, ASTM A563, and ASTM F844.
- H. Bearing Pads: Fiber-Reinforced Elastomeric Pads. Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer. Capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used on the project

2.03 PRODUCTION QUALITY CONTROL PROCEDURES: PCI MNL-116 unless specified otherwise.

- A. Forms: Provide forms that are mortar tight, of sufficient strength to withstand pressures due to concrete-placement and vibration operations and temperature changes and for prestressing and detensioning operations. Forms shall produce a smooth, dense surface. Chamfer exposed edges 3/4 in., unless otherwise indicated. Provide threaded or snap-off type form ties. Coat contact surfaces of forms with release agent, that is not detrimental to concrete, before reinforcement is placed. Avoid contamination of reinforcement and prestressing strand by release agent. Before placing concrete in forms, remove all dirt and

foreign matter.

- B. Reinforcement Placement: ACI 318/318R for placement and splicing. Reinforcement may be pre-assembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections.
- C. Concrete
 - 1) Concrete Mixing: ASTM C 94/C 94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.
 - 2) Concrete Placing: ACI 304R, ACI 305R for hot weather concreting, ACI 306.1 for cold weather concreting, and ACI 309R, unless otherwise specified.
 - 3) Concrete Curing: Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures in accordance with ODOT 00550.47.
- D. Prestressing: Do not transfer prestressing forces during detensioning until the concrete has reached a minimum strength of 3,500 psi, unless a higher strength is required by the furnished concrete mixture design.
- E. Surface Finish: Repairs located in a bearing area shall be approved by the Contracting Officer prior to repairs. Precast members containing hairline cracks, which are visible and are less than 0.01 in. in width, may be accepted, except that cracks larger than 0.005 in. in width for surfaces exposed to the weather shall be repaired. Defects that involve more than 36 sq. in. of concrete shall be grounds for rejection. Any precast member that is structurally impaired or contains honeycombed section deep enough to expose stressing tendons or reinforcing shall be rejected. Defects shall be repaired or rejected as specified in paragraph "Defects."
 - 1) Unformed Surfaces: Rake top slab surface to 1/4 in amplitude.
 - 2) Formed Surfaces: PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes.
 - (a) Unexposed Surfaces: Provide a standard grade surface finish.
 - (b) Exposed Surfaces: Provide a standard grade surface finish. The combined area of acceptable defective areas shall not exceed 0.2 percent of the exposed

to view surface area, and the patches shall be indistinguishable from the surrounding surfaces when dry.

F. Acceptance/Rejection of Defects

- 1) Minor Defects: All honeycombed areas, chipped corners, air pockets over 1/4 in. in diameter, and other minor defects involve less than 36 sq. in. of concrete shall be repaired. Form offsets of fins over 1/8 in. shall be ground smooth. All unsound concrete shall be removed from defective areas prior to repairing. All surfaces permanently exposed to view shall be repaired by a blend of Portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete.
- 2) Major Defects: Major defects are those, which involve more than 36 sq. in. of concrete or expose stressing tendons or reinforcing steel. If one or more major defects appear in a member, it shall be rejected. Cracks of a width of more than 0.01 in. shall be cause for rejection of the member.

2.04 TESTS, INSPECTIONS, AND VERIFICATIONS

- A. Aggregate Testing: In accordance with ODOT 00550.15 (b).
- B. Plastic Concrete Testing: In accordance with ODOT 00550.15 (c).
- C. Hardened Concrete:
 - 1) Compressive Strength: In accordance with ODOT 00550.15 (d).
 - 2) Chloride Ion Concentration Test: Sampling and determination of water-soluble chloride ion content in accordance with ASTM C 1218/C 1218M. Maximum water-soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed 0.06 percent by weight of cement.
 - 3) Chloride Ion Penetration Test: To ensure the durability of concrete in marine environment, concrete shall be proportioned to have the chloride ion penetration test in accordance with ASTM C 1202, and be below 1500 coulombs for concrete specimens tested at 28 days. Alternatively, a ponding test in accordance with AASHTO T 259 may be performed to validate chloride ion penetration in accordance with ASTM C 1202.

- D. Factory Inspection: At the option of the Contracting Officer, precast units may be inspected by the Contracting Officer or by the QC Representative prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

PART 3 EXECUTION

- 3.01 EXAMINATION: Prior to erection, and again after installation, precast members shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by the Contracting Officer, precast members that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast members.
- 3.02 ERECTION: Precast members shall be erected after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Erect in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Provide a 1:500 tolerance, if no tolerance is specified. Brace precast members, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads. Place precast members level, plumb, square, and true within tolerances. Align member ends.
- 3.03 BEARING SURFACES: Shall be flat, free of irregularities, and properly sized. Correct bearing surface irregularities with nonshrink grout. Provide bearing pads where indicated or required. Do not use hardboard-bearing pads. Place precast members at right angles to the bearing surface, unless indicated otherwise, and draw-up tight without forcing or distortion, with sides plumb.
- 3.04 ANCHORAGE: Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.
- 3.05 WELDING: AWS D1.4 for welding connections and reinforcing splices. Protect the concrete and other reinforcing from heat during welding. Weld continuously along the entire area of contact. Grind smooth visible welds in the finished installation.
- 3.06 OPENINGS: Holes or cuts requiring reinforcing to be cut, which are not indicated on the approved shop drawing,

shall only be made with the approval of the Contracting Officer and the precast manufacturer. Drill holes less than 12 in. in diameter with a diamond tipped core drill.

- 3.07 GROUTING: Clean and fill indicated keyways between precast members, and other indicated areas, solidly with nonshrink grout. Remove excess grout before hardening.
- 3.08 CONSTRUCTION RECORDS: Complete construction records shall be kept of the manufacturing, handling, and erection of the precast-prestressed concrete members. Records shall be kept for, but not limited to, the following items:
- A. Specifications of material used in the manufacture of the members.
 - B. Time-temperature history of the concrete members from casting to the transfer of the prestress force.
 - C. Records of the tendon stressing operation including initial prestress force, measured elongation, how it was measured, and how the tendons were stressed and de-stressed.
 - D. Records of inspection of the members before and after the prestress force is transferred to the members.
 - E. Records of the inspection of the members each time they are moved.
 - F. Records of any defects in the member and any corrective measures taken.

END OF SECTION

DIVISION 05 - METALS

SECTION 05 12 00 - STRUCTURAL STEEL

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the contractor to comply with the structural steel requirement listed herein and in accordance with the drawings.
- 1.02 APPLICABLE PUBLICATIONS: 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.
- A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
- | | |
|----------|---|
| AISC 325 | (2005) Manual of Steel Construction |
| AISC 326 | (2002) Detailing for Steel Construction |
- B. ASTM INTERNATIONAL (ASTM)
- | | |
|-------------------|--|
| ASTM A 36/A 36M | (2005) Carbon Structural Steel |
| ASTM A 499 | (2008) Standard Specification for Steel Bars and Shapes |
| ASTM A 563 | (2007) Standard Specification for Carbon and Alloy Steel Nuts |
| ASTM A 572/A 572M | (2007) High-Strength Low-Alloy Columbium-Vanadium Structural Steel |
| ASTM F 594 | (2002) Stainless Steel Nuts |
| ASTM F 959 | (2007) Standard Specification for Compressible Washer Type Direct Tension Indicators for Use with Structural Fasteners |
- C. AMERICAN WELDING SOCIETY (AWS)
- | | |
|----------------|---|
| AWS D1.1/D1.1M | (2006; Errata 2006) Structural Welding Code - Steel |
|----------------|---|
- 1.03 SYSTEM DESCRIPTION: Provide the structural steel system, complete and ready for use. Structural steel systems including design, materials, installation, workmanship,

fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 325 except as modified in this contract.

1.04 MODIFICATIONS TO REFERENCES: Conform to AISC 325, except as modified in this section.

1.05 SUBMITTALS: Submit the following in accordance with Section 01 33 00 "SUBMITTAL PROCEDURES":

A. Shop Drawings

- 1) Fabrication drawings
- 2) Welded Shear Stud Connectors

B. Certificates

- 1) Steel
- 2) Bolts, nut, and washers
- 3) Welding electrodes and rods
- 4) Galvanizing
- 5) Welding procedures and qualifications

1.06 QUALITY ASSURANCE

A. Drawing Requirements: Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 325 and 326. Fabrication drawings shall not be reproductions of contract drawings. Sign and seal fabrication drawings by a professional engineer registered in the State where the project is located. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS standard welding symbols. Shoring and temporary bracing shall be designed and sealed by a registered professional engineer and submitted for record purposes as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

B. ERECTION PLAN: Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing, and a detailed sequence of welding, including each welding procedure required.

C. WELDING PROCEDURES AND QUALIFICATIONS: Prior to welding

submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact the he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.01 STEEL

- A. STEEL PLATE: ASTM A 36/A 36M with an epoxy coating system in accordance with section 09 97 13.26, COATING OF STEEL WATERFRONT STRUCTURES.
- B. STRUCTURAL STEEL SHAPES: ASTM A 572/A 572M, Grade 50 with an epoxy coating system in accordance with section 09 97 13.26, "COATING OF STEEL WATERFRONT STRUCTURES".

2.02 STRUCTURAL STEEL ACCESSORIES

- A. Welding Electrodes and Rods: AWS D1.1/D1.1M
- B. Welded Shear Studs Connectors: AWS D1.1/D1.1M
- C. High Strength Tie Rods: ASTM A499
- D. Load Indicator Washers: ASTM F959
- E. Heavy Hex Nuts: ASTM A563

PART 3 EXECUTION

- 3.01 FABRICATION: Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible.

Structural steelwork shall be prepared for painting in accordance with Section 09 97 13.26, "COATING OF STEEL WATERFRONT STRUCTURES".

- 3.02 ERECTION: Erection of structural steel shall be in accordance with the applicable provisions OF AISC 325.
 - A. STORAGE: Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.03 GAS CUTTING: Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any member.

3.04 WELDING: AWS D1.1/D1.1M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

A. WELDS

1) Removal Of Temporary Welds, Run-off Plates, And Backing Strips: Remove from finished areas. Elsewhere removal is not required, but shall be field coated in accordance with section 09 97 13.26 COATING OF STEEL WATERFRONT STRUCTURES.

2) Visual Inspection: AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns.

3) Non Destructive Testing: AWS D1.1/D1.1M. Test locations shall be selected by the Contracting Officer. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested by radiographic or ultrasonic testing, as approved by the Contracting Officer. When all welds made by an individual welder are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

3.05 FIELD QUALITY CONTROL: Perform field tests, and provide labor, equipment, and incidentals required for testing. The Contracting Officer shall be notified in writing of defective bolts, nuts, and washers within 7 working days of the date of inspection.

-- End of Section --

DIVISION 09 – FINISHES

SECTION 09 97 13.26 – COATING OF STEEL WATERFRONT STRUCTURES

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the coating requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of steel pile coatings with at least five years experience.
- 1.02 APPLICABLE PUBLICATIONS: 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.
- A. ASTM INTERNATIONAL (ASTM)
- | | |
|-------------|--|
| ASTM D 7091 | (2005) Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nondestructive Coatings Applied to Non-Ferrous Metals |
| ASTM E 376 | (2006) Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods |
- B. THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
- | | |
|------------|---|
| SSPC AB 3 | (2003; E 2004) Newly Manufactured or Re-Manufactured Steel Abrasives |
| SSPC PA 1 | (2000; E 2004) Shop, Field, and Maintenance Painting |
| SSPC PA 2 | (2004) Measurement of Dry Coating Thickness With Magnetic Gages |
| SSPC SP 1 | (1982; E 2004) Solvent Cleaning |
| SSPC SP 10 | (2007) Near-White Abrasive Blasting |
- 1.03 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES":

A. Product Data

- 1) Epoxy Polyamide Coating
- 2) Steel Grit Blast Material

B. Certificates

- 1) Epoxy Polyamide Coating
- 2) Steel Grit Blast Material

1.04 ENVIRONMENTAL CONDITIONS: Start work only when ambient and curing temperatures are within limits of coating manufacturer's recommendations and at least 5 degrees F above dew point temperature.

1.05 SAFETY AND HEALTH PRECAUTIONS: Materials listed in this section contain volatiles, which are toxic. Follow safety procedures as recommended by manufacturer. Work in a well-ventilated area. Provide, and require workers to use, impervious clothing, gloves, face shields (8 in. minimum), and other appropriate protective clothing necessary to prevent eye and skin contact with coating materials. Keep coatings away from heat, sparks and flames.

PART 2 PRODUCTS

1.06 COATING MATERIALS

A. Epoxy Polyamide Coating: Provide catalyst components for coatings specific for resin components. Use thinners, which are compatible with the coating.

B. The product shall be an impermeable coating system specifically designed for use and submersion in the marine environment for corrosion protection of steel. The finished color for piles and steel framing shall be black. The finished color for mooring hardware shall be safety yellow. The product shall have excellent resistance to abrasion, chemical degradation, and ultraviolet exposure. The product shall be in accordance with the latest Federal and State environmental standards. At a minimum, the products shall meet the following criteria:

- 1) 800 psi adhesion to steel substrate;
- 2) Suitable for damp application; and
- 3) Below the state of Oregon VOC limit.

Products that are considered meeting these requirements for piles and steel framing include but are not limited to the following:

- 1) Bar Rust 235
ICI Paints
925 Euclid Ave
Cleveland, OH 44115
1-800-984-5444
- 2) Carbo Guard 1209
Carboline
350 Hanley Industrial Court
St. Louis, MO 63144-1599
1-314-644-1000
- 3) Amercoat 235
Ameron International
13010 Morris Road, Suite 400
Alpharetta, GA 30004
1-678-393-0653

Products that are considered meeting these requirements for mooring hardware include, but are not limited to the following:

- 4) Primer: Pre-Prime 167
Intermediate Coat: Bar-Rust 236
Top Coat: Devthane 379UVA (Safety Yellow)
ICI Devco Coatings
925 Euclid Avenue
Cleveland, OH 44115
Tel: 800-984-5444
- 5) Primer: Carbomastic 615 HS
Top Coat: Carbothane 134 HG (Safety Yellow)
Carboline
350 Hanley Industrial Court
St. Louis, MO 63144-1599
Tel: 314-644-1000

1.07 BLASTING MATERIALS: SSPC AB 3. Blasting material shall be a Class 1, steel abrasive, metallic grit of G25 grit size. Submit steel grit blast material information. Silica sand, shot, or spherical shaped abrasives are not permitted.

PART 3 EXECUTION

3.01 CLEANING AND PREPARATION OF SURFACES

- A. Surface Preparation: All surfaces to receive coating shall be prepared in accordance with SSPC PA 1, SSPC-SP1, and SSPC-SP10.
- B. Solvent Cleaning: SSPC-SP1. Remove visible oil, grease, and drawing and cutting compounds by solvent cleaning.
- C. Blast Cleaning: SSPC-SP10. After solvent cleaning,

complete surface preparation by near-white blast cleaning. Remove residual dust from blasted surface by blowing with dry, oil-free air, vacuuming, or sweeping. Provide a surface profile in accordance with the manufacturer's recommendations, but not less than 2 1/2 mils nor more than 4 mils.

- D. Any on-site work areas where blast cleaning is to occur are to be fully contained so that grit and corrosion does not fall into the water. A suitable blast cleaning collection system shall be employed and submitted for review and approval.

3.02 PROPORTIONING AND MIXING OF COATING SYSTEM: Proportioning and mixing of epoxy coating system components shall be performed per manufacturer's recommendations.

3.03 COATING APPLICATION

- A. General: Apply coating to dry surfaces not more than 4 hours after near-white blast cleaning. Apply coats of each system so that finished surfaces are free from runs, sags, brush marks, and variations in color. Unless otherwise specified by manufacturer's recommendations, do not allow drying time between coats to exceed 72 hours. Under conditions of direct sunlight or elevated ambient temperatures of 90 degrees F or greater, limit intercoat drying period to a maximum of 24 hours.

- B. Dry Film Thickness - Piles and Steel Framing: Apply each coat at a dry film thickness of not less than 8 mils. Apply two coats. Provide total system minimum dry film thickness of 16 mils. Measure using a magnetic gage in accordance with SSPC PA 2.

- C. Dry Film Thickness - Mooring Hardware: For mooring hardware, apply a single coat of primer and intermediate coatings per manufacturer's recommendations and apply a minimum 2.5 mil (dry thickness) yellow top coating until completely opaque.

- D. Repair of Defects: Repair detected coating holidays, thin areas, and exposed areas damaged prior to or during installation by surface treatment and application of additional coating or by manufacturer's recommendations. Allow a period of at least 72 hours to pass following final coat before placing in immersion service.

3.04 SURFACES TO BE COATED

- A. Piles and Steel Framing: Piles shall be coated the full length. Steel Framing shall be coated on all surfaces.

- B. Mooring Hardware: Mooring hardware shall be coated on all

exterior surfaces.

3.05 FIELD TESTS: Field tests shall be witnessed by the Contracting Officer. Advise the Contracting Officer 5 days prior to performing each field test.

- A. Holiday Testing: Prior to installation, test for holidays in total coating system. Use a low-voltage holiday detector of less than 90 volts in accordance with manufacturer's instructions. After repair of holidays by surface treatment and application of additional coating or by manufacturer's recommendation, retest with a low-voltage holiday detector.
- B. Dry Film Thickness: After repair of holidays, measure dry film thickness using a magnetic dry film thickness gage in accordance with SSPC PA 2, ASTM D7091, and ASTM E376. Re-measure after an additional coat is applied, and add it to meet minimum thickness requirements.

-- End of Section --

DIVISION 31 - EARTHWORK

SECTION 31 62 16.16 – STEEL PIPE PILES

PART 1 GENERAL

- 1.02 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the steel pipe pile requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of steel pipe pile driving and installation with at least five years experience.
- 1.03 APPLICABLE PUBLICATIONS: 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.
- A. ASTM INTERNATIONAL (ASTM)
 - ASTM A 252 (1998; R 2002) Welded and Seamless Steel Pipe Piles
 - ASTM D 4945 (2000) High-Strain Dynamic Testing of Piles
 - B. AMERICAN WELDING SOCIETY (AWS)
 - AWS D1.1 (2006; Errata 2006) Structural Welding Code - Steel
- 1.04 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES":
- A. Shop Drawings
 - 1) Pile placement plan: Submit pile placement plan at least 30 days prior to delivery of piles to the job site.
 - B. Product Data
 - 1) Driving Equipment
 - 2) Driving Helmet
 - 3) Pile Tip Driving Shoes
 - 4) Delivery, Storage, and Handling: Submit delivery, storage, and handling plans for piles at least 30 days prior to delivery of piles to the job site.

- 5) Bubble Curtain
- C. Design Data
 - 1) Pile driving design calculations
- D. Test Reports
 - 1) Dynamic Testing of Piles
- E. Certificates
 - 1) Contractor qualifications
 - 2) Driving equipment
 - 3) Steel pipe piles
 - 4) Procedures to progress difficult piles
- F. Records: Submit to the Contracting Officer complete and accurate job pile records as specified in paragraph entitled "Records" of this section, within 15 calendar days after completion of driving. Pile driving records close out submittals:
 - 1) Sizes, lengths, and locations of piles
 - 2) Sequence of driving
 - 3) Number of blows per foot for entire length of piles and set for last ten (10) blows
 - 4) Final tip and head elevations
 - 5) Pile driving analyzer results
- 1.05 DELIVERY, STORAGE, AND HANDLING: Delivery, storage, and handling of materials shall conform to the requirements specified herein. Plans for the delivery, storage, and handling of piles shall be developed and submitted in accordance with paragraph "Submittals."
 - A. Delivery and Storage: Piles shall be stacked during delivery and storage so that each pile is maintained in a straight position and is supported every 10 ft or less along its length (ends inclusive) to prevent exceeding the maximum camber or sweep. Piles shall not be stacked more than 5 ft high.
 - B. Handling: Piles shall be lifted using a cradle or multiple points pick-up to ensure that the maximum permissible camber is not exceeded due to insufficient support, except that a one-point pick-up may be used for lifting piles

that are not extremely long into the driving leads. Point pick-up devices shall be approved. Holes may be burned in the pile above the cutoff length for lifting into the leads. Piles shall not be dragged across the ground. The Contractor shall inspect piles for excessive camber and for damage before transporting them from the storage area to the driving area and immediately prior to placement in the driving leads. Camber shall be measured at the mid-length of the pile. The maximum permissible camber shall be 2 in. over the length of the pile. Piles having excessive camber will be rejected.

- 1.06 CONTRACTOR QUALIFICATIONS: The Contractor or his/her specialty subcontractor shall have been in business a minimum of 5 years, and shall be fully experienced in all aspects of installing piles. Submit a list of three similar projects that the Contractor or his/her specialty subcontractor has completed, along with points of contact for these projects. Include the location, contract name, and completion dates for the projects. Include names, telephone numbers and fax numbers of a supervisory level point of contact at each facility or installation who has knowledge of the Contractor's or specialty subcontractor's work performance.
- 1.07 NOTIFICATION OF WORK: The Contractor shall provide pile driving schedule to all local residents and businesses within 500 ft radius of the job site. Notification shall be made via mail (at a minimum) at least 15 days prior to pile driving. The notice shall include the hours of operation and the range of dates for which the pile driving is scheduled to occur.
- 1.08 BASIS FOR BIDS: Base bids on the number and total required length of piles as needed for installation as indicated. Piles shall be delivered to the work site direct from the manufacturer in lengths long enough to meet the total design length requirements as stated in the drawings. Each steel pile shall be provided in one piece without splices unless otherwise permitted by the Contracting Officer. When splicing is permitted, only one splice will be permitted per length of pile with extensions 5 ft or more in length located below mudline. Once driven to the minimum required depth and capacity, extra pile length shall be cut to design specifications. Adjustment in contract price will not be made for cutting off piles, for any portion of a pile remaining above the cutoff elevation, or for damaged or rejected piles.
- 1.09 ENVIRONMENTAL CONTROLS
- A. Bubble Curtain: Contractor shall design, furnish, install, and correctly operate an air bubble curtain system to attenuate underwater sound pressure caused by impact pile

driving. The primary requirement is to engulf the pile in bubbles during impact pile driving. At the end of the project, the bubble curtain components shall become the property of the Contractor. A pile driving bubble curtain shall be used during all pile driving operations. See Section 01 35 29 for details and environmental requirements.

- B. Work Hours: Pile driving operations shall occur during daylight hours only.

PART 2 PRODUCTS

- 2.01 PILES: Steel pipe piles: Minimum 45 ksi yield strength, conforming to the requirements of ASTM A 252, Grade 3, seamless or straight seam. Spiral welded pipe is not permitted.
- 2.02 PILE SHOES: Piles shall be driven open-ended with cast steel pile tip driving shoes. Pile shoes shall be inside or flush-fitting.
- 2.03 PILE COATING: The exterior surface of the piles shall be coated from the top end to the length specified in the drawings in accordance with Section 09 97 13.26.

PART 3 EXECUTION

3.01 PILE DRIVING EQUIPMENT

- A. Pile Driving Hammers: Pile driving hammers shall be of the impact or vibratory type.

- 1) Impact Hammers: Impact hammers shall be steam, air, or diesel-powered pile hammers of the single-acting, double-acting, or differential-acting type. The size or capacity of hammers shall be as recommended by the hammer manufacturer for the total pile mass weight and the character of the soil formation to be penetrated. Boiler, compressor, or engine capacity shall be sufficient to operate hammers continuously at the full rated speed. Hammers shall have a gage to monitor hammer bounce chamber pressure for diesel hammers or pressure at the hammer for air and steam hammers. This gage shall be operational during the driving of piles and shall be mounted in an accessible location for monitoring by the Contractor and the Contracting Officer. Driving energy shall be obtained by use of a heavy ram and a short stroke with low impact velocity, rather than a light ram and a long stroke with high impact velocity. Position a pile cap or drive cap between the pile and hammer. Place hammer cushion or cap block between ram and the pile cap or drive cap. Hammer cushion or cap block shall have consistent

elastic properties, shall minimize energy absorption, and shall transmit hammer energy uniformly and consistently during the entire driving period. Do not use a pile cushion block. In accordance with paragraph "Submittals", submit the following information for each impact hammer proposed:

- (a) Make and model
 - (b) Ram weight (pounds)
 - (c) Anvil weight (pounds)
 - (d) Rated stroke (inches)
 - (e) Rated energy range (foot-pounds)
 - (f) Rated speed (blows per minute)
 - (g) Steam or air pressure, hammer and boiler or compressor (psi)
 - (h) Pile driving cap, make and weight (pounds)
 - (i) Cushion block dimensions and material type
 - (j) Power pack description
- 2) Vibratory Hammers: The size or capacity of hammers shall be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. The hammer shall provide for maintaining a rigid connection between the hammer and the pile. In accordance with paragraph "Submittals", submit the following information for each vibratory hammer proposed:
- (a) Make and model
 - (b) Eccentric moment (inch-pounds)
 - (c) Dynamic force (tons)
 - (d) Steady state frequency or frequency range (cycles per minute)
 - (e) Vibrating weight (pounds)
 - (f) Amplitude (inches)
 - (g) Maximum pull capacity (tons)
 - (h) Non-vibrating weight (pounds)

(i) Power pack description

- B. Pile Driving Leads: Hammers shall be supported and guided with fixed leads.
- C. Driving Helmets and Pile Cushions: A driving helmet or cap, including a pile cushion, shall be used between the top of the pile and the ram to prevent impact damage to the pile. The driving helmet, or cap and pile cushion combination, shall be capable of protecting the head of the pile, minimizing energy absorption and dissipation, and transmitting hammer energy uniformly over the top of the pile. The driving helmet or cap shall fit loosely around the top of the pile so that the pile is not restrained by the driving cap if the pile tends to rotate during driving. The pile cushion may be made of solid wood or of laminated construction using plywood, softwood, or hardwood boards or other cushion material as approved by the Contracting Officer. The pile cushion shall completely cover the top surface of the pile and shall be retained by the driving helmet. The minimum thickness of the pile cushion shall be 3 in. and the thickness shall be increased so as to be suitable for the size and length of pile, character of subsurface material encountered, hammer characteristics, and required driving resistance.

3.02 INSTALLATION: Inspect piles when delivered and when in the leads immediately before driving. Piles shall be handled so as to protect pile coatings and avoid damage to the pile and other structures. Repair damage or defects in pile coatings as specified by coating manufacturer. Cut piles at cutoff elevation by an approved method. Contractor to expect installing difficult piles through anticipated obstructions, which may include pulling and re-driving, spudding and/or drilling.

- A. Driving Piles: Installed piles shall have a minimum working load capacity of 150 tons and a minimum tip elevation as shown on the drawings. Operate hammer at manufacturer's rated speed and drive piles without interruption to reach the required driving resistance and depth of penetration. The Contractor shall submit pile driving calculations employing a WEAP analysis sealed by a professional engineer to determine the required energy for the specific hammer to be used to achieve the required capacity. Dynamic pile stresses shall not exceed the crushing strength of the piles. Drive piles with the same hammer, cushion, or cap block, and use the same operating conditions as the initial piles. If, in driving, it is found that a pile is not of sufficient length to give the capacity specified, notify the Contracting Officer, who shall determine the procedure to be followed.
- B. Pile Placement and Tolerances in Driving: A pile placement

plan which shows the installation sequence and the methods proposed for controlling the location and alignment of piles shall be developed and submitted in accordance with paragraph "Submittals". Foundation preparation shall be completed in the area prior to the placement of piles for driving. Piles shall be placed accurately in the correct location and alignments, both laterally and longitudinally, and to the vertical lines indicated. The Contractor shall establish a permanent base line to provide for inspection of pile placement by the Contracting Officer during pile driving operations. The base line shall be established prior to driving job piles and shall be maintained during the installation of the job piles. A final lateral deviation from the correct location at the cutoff elevation of not more than 1 in. will be permitted for vertical piles. Manipulation of piles will not be permitted. A variation of not more than 0.25 in. per ft of pile length from the vertical for vertical piles will be permitted. Redesign of pile caps or additional work required due to improper location of piles will be the responsibility of the Contractor and shall be performed at no additional cost to the Government. A vertical deviation of not more than 1 in. from the correct cutoff elevations shown will be permitted. Inspect piles for heave. Re-drive heaved piles to the required tip elevation/capacity. The correct relative position of all piles shall be maintained by the use of templates or by other approved means. Piles damaged or not located properly or exceeding the maximum limits for lateral and vertical deviation, and variation in alignment shall be pulled and new piles redriven, or provide additional piles, at a location directed, at no additional cost to the Government.

- C. Jetting Of Piles: Jetting of piles shall not be permitted.
- D. Predrilling: Predrilling, up to 75 percent of size of pile, shall be permitted. Discontinue predrilling when the pile tip is approximately 5 feet above the required pile tip elevation. Drive pile the final 5 feet of penetration. Predrilling equipment and method shall be approved by the Contracting Officer prior to commencing predrilling operation.
- E. Long Piles: Handle and drive piles of a high slenderness ratio carefully to prevent overstress. Provide pile driving rig with rigid supports so that leads remain accurately aligned. Where a high degree of accuracy is required, erect templates or guide frames at or close to the ground or water surface.
- F. Pulled Piles: Piles damaged or impaired for use during driving shall be pulled and replaced with new piles, or shall be cut off and abandoned and new piles driven as

directed without additional cost to the Government.

- G. Splices: When approved, provide splices of the full penetration butt weld type. Use only one splice per length of pile. Construct splices to maintain the true alignment and position of the pile sections. Splices shall develop the full strength of the pile in shear, bearing and bending.
- H. Welding: All welding shall be in accordance with AWS D1.1.
- I. Cutting of Casings: Cutting of casings shall be with an acetylene torch or saw with prior approval by the Contracting Officer.

- 3.03 OBSTRUCTIONS AND DIFFERING SITE CONDITIONS : If conditions during driving indicate that the pile is hitting an obstruction or if site conditions differ materially from the requirements of these Specifications, the Contractor shall first try to circumvent the obstruction and the Contracting Officer shall be notified immediately of the changed conditions. The Contracting Officer's judgment shall be final as to the course of action to be taken.

Where obstructions or very dense granular layers make it impossible to install certain piles at locations shown on the Drawings and/or to the proper depths, resort to all usual methods for pile installation, including spudding and excavation. Prior to pile driving, excavate to a depth of 5 feet and remove obstructions. If, in the judgment of the Contracting Officer the Contractor is unable to complete the proper installation of any pile, by and after resorting to such methods, the Contracting Officer may order an additional pile or piles be driven or that other remedial action be taken. Pull out any pile abandoned because of obstructions encountered before reaching the anticipated depth. Fill the open hole with concrete or soil at the discretion of the Contracting Officer and at no cost to the Owner.

If the Contracting Officer determines that obstructions more than 5 feet below mudline elevation or greater than 1 cu yd in volume should be removed by excavation, the Contractor will be reimbursed for the additional work of removing obstructions and backfilling on a time and materials basis. No additional payment for removal of any obstruction will be made unless approval of such work, including agreement for extra compensation for such, has been made in writing by the Contracting Officer in advance of execution of the work.

Cut off or pull out, at the discretion of the Contracting Officer, abandoned piles which cannot be driven to the required depth by the "usual methods" because of

obstructions. In either case, the Contractor will be paid in accordance with a written agreement for compensation for such work. The written agreement shall be approved in advance of executing the work.

3.04 NON-CONFORMING PILES: Non-conforming Piles: Piles that fail tests, are installed out of tolerance, are below cutoff elevation, are damaged, or are not driven to specified bearing stratum. Provide additional piles or supplement piles to meet specified requirements at no additional cost to the Owner. Replace or cut off and splice to an intact section, at the discretion of the Contracting Officer, piles which break above ground surface or within 10 feet of ground surface at no additional cost to the Owner.

3.05 FIELD QUALITY CONTROL: Drive all piles in the presence of the Contracting Officer. Provide to the Contracting Officer free and safe access to the work at all times. Mark each pile in readily visible 1 foot intervals from the tip. Mark each 5 feet with a numeral. Mark 1 inch intervals near the butt of the segment where final take-up is expected. Alternately provide a rule marked in inches close to each driven pile to permit observation of the final penetration blows per inch.

3.06 PILE TESTS

A. Dynamic Testing of Piles: both a WEAP and PDA shall be used to complete pile driving operations.

1) Wave Equation Analysis of Piles (WEAP): The Contractor shall employ a specialty engineering firm to perform and submit a WEAP analysis sealed by a professional engineer. The WEAP analysis shall specify the energy, equipment settings, and pile driving criteria for the hammer to be used in order to achieve the required pile capacity. The analysis and results shall be submitted in accordance with paragraph "Submittals." Dynamic pile stresses shall not exceed the crushing strength of the piles. The pile driving equipment shall be selected and operated in accordance with the WEAP analysis findings.

2) Pile Dynamic Analyzer (PDA): The Contractor's specialty engineering firm shall perform on-site pile dynamic analyzing to determine velocity of stress wave propagation, acceleration, monitor hammer and drive system performance, assess pile installation stresses and integrity, and to evaluate pile capacity. A minimum of two piles are to be dynamic tested during production driving. Equipment to obtain dynamic measurements, record, reduce and display its data shall be furnished and meet the requirement of ASTM D 4945. The equipment shall have been calibrated within 12 months thereafter

throughout the contract duration. All power requirements for operating the equipment shall be supplied by the Contractor.

3) Pier Support Piles: Dynamic pile testing shall be performed on at least two (2) pier support piles during the full length of pile driving. Tested piles shall be as selected by the Contracting Officer over the duration of installation. The Contracting Officer will direct testing of additional piles if the hammer or driving system is modified or replaced.

4) Reports: A summary report of dynamic test results for test piles shall be prepared and submitted in accordance with paragraph "Submittals." The report shall discuss pile capacity obtained from dynamic testing and also include velocity of stress wave propagation, acceleration, evaluation of hammer and driving system performance, driving stress levels, and pile integrity. Analysis of the dynamic test data shall be performed and used to predict pile capacity, establish resistance distribution, and predict quake and damping factors. Refined wave equation analyses incorporating the results of dynamic testing and analysis shall be included. A field summary report shall be prepared and submitted in accordance with paragraph "Submittals." The field summary report shall minimally contain energy transferred to the pile, calculated driving stresses, pile integrity and estimated pile capacity at the time of testing, and the pile driving record as an attachment and also address the items listed in paragraph "7.1.5 Dynamic Testing" of ASTM D 4945.

3.07 RECORDS: Keep a complete and accurate record of each pile driven using the attached form. Indicate the pile location, deviations from design location, cross section shape and dimensions, original length, ground elevation, tip elevation, cutoff elevation, penetration in blows per foot for the entire length of penetration, hammer data including rate of operation, make, and size, and unusual pile behavior or circumstances experienced during driving such as re-driving, heaving, weaving, obstructions, jetting, and unanticipated interruptions. Record the dimensions of driving helmet and cushion block used. Any unusual conditions encountered during pile installation shall be recorded and immediately reported to the Contracting Officer.

PILE DRIVING LOG

CONTRACT NO. _____ CONTRACT NAME _____
 CONTRACTOR _____ TYPE OF PILE _____
 PILE LOCATION _____ PILE SIZE: BUTT/TIP: _____ LENGTH _____
 GROUND ELEVATION _____ CUT OFF ELEVATION _____
 PILE TIP ELEVATION _____ VERTICAL (_____) BATTER 1 ON (_____)
 SPLICES ELEVATION _____ COMPANY _____
 HAMMER: MAKE & MODEL _____ WT. RAM _____
 STROKE _____ RAM RATED ENERGY _____
 DESCRIPTION & DIMENSIONS OF DRIVING CAP _____
 CUSHION MATERIALS & THICKNESS _____
 INSPECTOR _____
 "DEPTH" COLUMN OF pile driving records REFERENCED TO:
 _____ CUT-OFF ELEVATION _____
 _____ FINISH FLOOR ELEVATION _____
 TIME: START DRIVING _____ FINISH DRIVING _____ DRIVING TIME _____
 INTERRUPTIONS (TIME, TIP ELEV. & REASON) _____
 JET PRESSURE & ELEVATIONS _____

		DRIVING RESISTANCE									
DEPTH	NO. OF	DEPTH	NO. OF	DEPTH	NO. OF	DEPTH	NO. OF	DEPTH	NO. OF	DEPTH	NO. OF
FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS
0	_____	20	_____	40	_____	60	_____	80	_____	100	_____
1	_____	21	_____	41	_____	61	_____	81	_____	101	_____
2	_____	22	_____	42	_____	62	_____	82	_____	102	_____
3	_____	23	_____	43	_____	63	_____	83	_____	103	_____
4	_____	24	_____	44	_____	64	_____	84	_____	104	_____
5	_____	25	_____	45	_____	65	_____	85	_____	105	_____
6	_____	26	_____	46	_____	66	_____	86	_____	106	_____
7	_____	27	_____	47	_____	67	_____	87	_____	107	_____
8	_____	28	_____	48	_____	68	_____	88	_____	108	_____
9	_____	29	_____	49	_____	69	_____	89	_____	109	_____
10	_____	30	_____	50	_____	70	_____	90	_____	110	_____
11	_____	31	_____	51	_____	71	_____	91	_____	111	_____
12	_____	32	_____	52	_____	72	_____	92	_____	112	_____
13	_____	33	_____	53	_____	73	_____	93	_____	113	_____
14	_____	34	_____	54	_____	74	_____	94	_____	114	_____
15	_____	35	_____	55	_____	75	_____	95	_____	115	_____
16	_____	36	_____	56	_____	76	_____	96	_____	116	_____
17	_____	37	_____	57	_____	77	_____	97	_____	117	_____
18	_____	38	_____	58	_____	78	_____	98	_____	118	_____
19	_____	39	_____	59	_____	79	_____	99	_____	119	_____

DRIVING RESISTANCE IN BLOWS PER INCH FOR LAST FOOT OF PENETRATION:

DEPTH _____ DEPTH _____
 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12"
 ELEV. _____ ELEV. _____

REMARKS _____

CUT OFF ELEVATION: FROM DRAWING _____

TIP ELEVATION = GROUND ELEVATION - DRIVEN DEPTH = _____

DRIVEN LENGTH = CUT OFF ELEVATION - TIP ELEVATION = _____

CUT OFF LENGTH = PILE LENGTH - DRIVEN LENGTH = _____

-- End of Section --

SECTION 31 62 21.10 – COMPOSITE PILES, PLASTIC AND FIBERGLASS CORE

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all work necessary by the Contractor to comply with the plastic fender pile requirements listed herein and in accordance with the drawings. Contractor shall be qualified in the field of plastic pile driving and installation with a at least five years experience.

1.02 APPLICABLE PUBLICATIONS: 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.

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 252	(1998; R 2002) Welded and Seamless Steel Pipe Piles
ASTM D 4945	(2000) High-Strain Dynamic Testing of Piles
ASTM D 570	(1981; R 1988) Water Absorption of Plastics
ASTM D 638	(1994; Rev. B) Tensile Properties of Plastics
ASTM D 695	(1991) Compressive Properties of Rigid Plastics
ASTM D 792	(1991) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 4329	(1992) Operation Light and Water Apparatus (Fluorescent UV Condensation Type) for Exposure of Plastics
ASTM D 4060	(2007) Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D 746	(2007) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 2240	(2005) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D 790	(2007) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

1.03 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES."

A. Shop Drawings: Plastic fender pile catalog cuts shall include indicate compliance with the specifications as described herein.

B. Product Data:

1) Driving Equipment

2) Plastic Piles

C. Records: Submit pile driving records within seven calendar days after completion of driving.

1.04 DELIVERY, STORAGE, HANDLING:

A. The Contractor shall inspect each pile, upon delivery, for surface damage, cracks, blemishes, scaring and straightness. The condition of each pile shall be recorded and the delivery inspection report shall be submitted to the Contracting Officer. The Contractor shall handle the piles with ropes or nylon slings without dropping, breaking, bruising or penetrating outer surface with tools. Do not use cant dogs, peaveys, hooks or pike-poles. Protect piles from damage.

B. Store piles above the ground on blocking which is shaped or padded and prevent scaring or sagging of the piles. Storage racks shall be arranged to permit air circulation and piles shall be covered from direct sunlight. Piles shall be lowered to dunnage with crane or fork lift. Piles are not to be rolled off tines of forklift.

PART 2 PRODUCTS

2.01 PILES

A. Provide composite plastic piles reinforced with fiberglass reinforcing bars manufactured as specified. Plastic piles shall act compositely with the fiberglass reinforcing. All plastic fender piles shall be the product of a single manufacturer. Piles shall be fabricated in one piece.

B. Potential plastic pile manufacturers that have demonstrated that they are capable of meeting the necessary requirements contained herein are:

- 1) Plastic Pilings, Inc.
1485 South Willow Avenue
Rialto, CA 92367
T. 909-874-4080

- C. Splices will not be permitted. All plastic fender piles shall be delivered to the job site complete and ready to drive.
- D. Pile and reinforcement dimensions shall be as follows:
 - 1) Minimum pile diameter shall be 12 inches; maximum diameter shall be 14 inches. Note that fender pile diameters larger than 12 inches may necessitate modifications to the existing fender chocks.
 - 2) Minimum pile length shall be 60 ft.
 - 3) Minimum number and size of fiberglass reinforcing bars shall be 12, 1 inch diameter bars.
 - 4) Spiral reinforcing shall be 3/8 inch diameter with a pitch equal to one-half the outside diameter of the pile, less 2 inches. Spiral reinforcement shall be contain the longitudinal bars within its spiral.
 - 5) Minimum cover between the exterior surface of the pile and the reinforcement shall be 1 inch.
- E. Pile tops shall be covered with a plastic cover (boot).

2.02 MATERIALS

- A. Plastic: Plastic shall be a mixture of one or more of the following recycled post consumer or post industrial thermoplastics: high density polyethylene, polypropylene and low density polyethylene with a minimum of 4.0 percent (by weight) carbon black. The term "recycled" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. No used or rebuilt materials shall be used in the fabrication of the plastic fender piles. The plastic material shall conform to the following properties:
 - 1) Compressive Modulus (ASTM D695): 40,000 psi (min.)
 - 2) Compressive Strength (ASTM D695): 3,000 psi (min.)
 - 3) Tensile Strength (ASTM D638): 500 psi (min.) at break
 - 4) Abrasion Resistance (ASTM D4060): Wear Index = 2.72
 - 5) Brittleness (ASTM D746): 5 ft-lbs/in. no break at -40°F
 - 6) Density (ASTM D792): 40 to 65 pcf
 - 7) Hardness (ASTM D2240): 40 to 65 (Shore D)
 - 8) UV (ASTM D4329 B Lamp): 500 hours, less than 10% change
 - 9) Water Absorption (D570): 0 for the skin.
- B. Fiberglass Reinforcement: Longitudinal fiberglass reinforcing shall consist of individual reinforcing bars tied to a spiral cage with resin-coated fiberglass ribbon

per manufacturer's requirements. Splicing of longitudinal reinforcement is not permitted. Maintain alignment during fabrication. Fiberglass reinforcing shall have the following properties:

- 1) Ultimate Tensile Strength (D638): 70,000 psi (min.)
- 2) Flexural Strength (D790): 70,000 psi (min.)
- 3) Compressive Strength (D695): 45,000 psi (min.)

2.03 QUALITY CONTROL

- A. The government reserves the right to perform plant inspections of the plastic pile manufacturing process.
- B. Plastic piles shall cure at the plant for a minimum of two weeks prior to shipment to the site.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. Inspect piles when delivered and when in the leads immediately before driving. Secure piles in their proper alignment.
- B. Pile hammer shall be air, steam, or diesel powered, and of an approved type with a capacity at least equal to the hammer manufacturer's recommendation for the total weight of pile and character of subsurface material to be encountered.
- C. Provide pile shoes and driving pads as recommended by the pile manufacturer for the plastic piles. If a pile fails to reach the indicated tip elevation, notify Contracting Officer immediately, provide pile record with sufficient information to perform a wave equation analysis, and perform corrective measures as directed.
- D. Piles shall be driven in the location indicated. Fender piles may be manipulated a maximum of 0.25 inch per foot of pile length in a direction parallel to the pier face and 0.25 inch per foot of pile length in a direction perpendicular to the pier face. Remove and replace with new piles those damaged, dislocated, driven below the design cutoff, or driven out of alignment.
- E. Cut off piles with a smooth level cut using pneumatic tools or sawing. Use of explosives or burning for cutting is not permitted. Pile heads at cut-off shall be level and sound.
- F. Jetting or spudding of piles shall not be permitted without the approval of the Contracting Officer.

- G. Predrilling of piles shall not be permitted.

3.02 FIELD TREATMENT

- A. Field treat cuts, bevels, notches, refacing and abrasions made in the field in accordance with the manufacturer's recommendations. The tops of the piles shall be covered with an approved pile top. The cover shall be applied per the manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

- A. When Government inspections result in product rejection, the Contractor shall promptly segregate and remove rejected material from the premises.
- B. Each pile shall be measured for straightness prior to driving by placing a straight line from the center of the top to the center of the tip. The line shall lie entirely within the body of the pile. Piles not meeting this criteria shall be rejected.
- C. Each pile shall be inspected for cracks prior to driving. Prior to final completion and acceptance of construction, each pile shall again be inspected for cracks. Cracking of the piles shall be cause for rejection. The Contractor shall be responsible for all costs incurred to replace the rejected piles.
- D. Each pile shall be inspected for voids prior to installation. Any void larger than 1 cubic inch shall be cause for rejection.

3.04 FIELD DOCUMENTATION

- A. For each driven pile, the pile driving inspector shall keep a record of the number of blows required for each foot of penetration and number of blows for the last 6 inches penetration or fraction thereof. Include in the record the pile location, the beginning and ending times of each operation during driving of the pile, model, type and size of hammer used, rate of operation, stroke or equivalent stroke for diesel hammer, including the initial stroke, final stroke and all other changes in stroke occurring during the pile driving, type and weight of driving helmet, and type and dimension of hammer cushion (capblock) and pile cushion used. Record retap data and unusual occurrences during pile driving.
- B. Notify Contracting Officer 10 days prior to driving of piles. Make pile-driving records available to the Contracting Officer at the job site for a minimum of 48 hours after each day of driving.

3.05 WARRANTIES

- A. MANUFACTURER'S WARRANTY: The Manufacturer shall provide a warranty on all plastic piles to be free from defects in materials and workmanship. The Manufacturer shall replace all defective piles at the Manufacturer's expense.
- B. CONTRACTOR'S WARRANTY: The Contractor shall provide a warranty on all installed plastic piles to be free from defects in materials caused by mishandling prior to installation and improper installation. Within this time, the Contractor shall replace all defective piles at the Contractor's expense.

PILE DRIVING LOG

CONTRACT NO. _____ CONTRACT NAME _____
 CONTRACTOR _____ TYPE OF PILE _____
 PILE LOCATION _____ PILE SIZE: BUTT/TIP: _____ LENGTH _____
 GROUND ELEVATION _____ CUT OFF ELEVATION _____
 PILE TIP ELEVATION _____ VERTICAL (_____) BATTER 1 ON (_____)
 SPLICES ELEVATION _____ COMPANY _____
 HAMMER: MAKE & MODEL _____ WT. RAM _____
 STROKE _____ RAM RATED ENERGY _____
 DESCRIPTION & DIMENSIONS OF DRIVING CAP _____
 CUSHION MATERIALS & THICKNESS _____
 INSPECTOR _____
 "DEPTH" COLUMN OF pile driving records REFERENCED TO:
 _____ CUT-OFF ELEVATION _____
 _____ FINISH FLOOR ELEVATION _____
 TIME: START DRIVING _____ FINISH DRIVING _____ DRIVING TIME _____
 INTERRUPTIONS (TIME, TIP ELEV. & REASON) _____
 JET PRESSURE & ELEVATIONS _____

DRIVING RESISTANCE											
DEPTH	NO.OF	DEPTH	NO.OF	DEPTH	NO.OF	DEPTH	NO.OF	DEPTH	NO.OF	DEPTH	NO.OF
FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS	FT.	BLOWS
0	_____	20	_____	40	_____	60	_____	80	_____	100	_____
1	_____	21	_____	41	_____	61	_____	81	_____	101	_____
2	_____	22	_____	42	_____	62	_____	82	_____	102	_____
3	_____	23	_____	43	_____	63	_____	83	_____	103	_____
4	_____	24	_____	44	_____	64	_____	84	_____	104	_____
5	_____	25	_____	45	_____	65	_____	85	_____	105	_____
6	_____	26	_____	46	_____	66	_____	86	_____	106	_____
7	_____	27	_____	47	_____	67	_____	87	_____	107	_____
8	_____	28	_____	48	_____	68	_____	88	_____	108	_____
9	_____	29	_____	49	_____	69	_____	89	_____	109	_____
10	_____	30	_____	50	_____	70	_____	90	_____	110	_____
11	_____	31	_____	51	_____	71	_____	91	_____	111	_____
12	_____	32	_____	52	_____	72	_____	92	_____	112	_____
13	_____	33	_____	53	_____	73	_____	93	_____	113	_____
14	_____	34	_____	54	_____	74	_____	94	_____	114	_____
15	_____	35	_____	55	_____	75	_____	95	_____	115	_____
16	_____	36	_____	56	_____	76	_____	96	_____	116	_____
17	_____	37	_____	57	_____	77	_____	97	_____	117	_____
18	_____	38	_____	58	_____	78	_____	98	_____	118	_____
19	_____	39	_____	59	_____	79	_____	99	_____	119	_____

DRIVING RESISTANCE IN BLOWS PER INCH FOR LAST FOOT OF PENETRATION:

DEPTH _____ DEPTH _____
 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12"
 ELEV. _____ ELEV. _____

REMARKS _____

CUT OFF ELEVATION: FROM DRAWING _____

TIP ELEVATION = GROUND ELEVATION - DRIVEN DEPTH = _____

DRIVEN LENGTH = CUT OFF ELEVATION - TIP ELEVATION = _____

CUT OFF LENGTH = PILE LENGTH - DRIVEN LENGTH = _____

-- End of Section -