28TH STREET BOAT LAUNCH IMPROVEMENTS – CONSTRUCTION PHASE II

CONTRACT NO. 1836 - TECHNICAL SPECIFICATIONS

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PART 1 – GENERAL

1.01 GEOTECHNICAL ENGINEERING LETTER REPORTS

A. The Port has on file two letter reports, prepared by GeoEngineers, Inc., as follows.

1. Geotechnical Engineering Consultation Services, Port of Grays Harbor, 28th Street Recreation Improvements Project, Hoquiam, Washington, file No. 0102-061-00, dated April 29, 2014 (this letter report was provided in support of the Construction Phase I work).

2. Geotechnical Engineering Consultation Services, Port of Grays Harbor, 28th Street Recreation Improvements Project, Hoquiam, Washington, file No. 0102-061-00, dated December 17, 2014 (this letter report was provided in support of the Construction Phase II work).

B. Copies of these letter reports are available at the Port for inspection by prospective bidders. The letter reports present general information about soil and foundation conditions in the vicinity of the 28th Street boat launch.

C. The accuracy of the information in each letter report is subject to the limitations of scope and generally accepted practices in the field of geotechnical engineering at the time the report prepared. No warranty or other conditions are expressed or implied.

D. The report is not to be construed as part of the contract documents and is not to be referred to as such.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 01 20 00 – Price and Payment Procedures

B. Section 03 60 00 – Concrete Repair

1.02 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. City of Hoquiam Surface Water Management Manual, Volume 1, Minimum Technical Requirements and Site Planning.

B. Washington State Department of Transportation (WSDOT) and the American Public Works Association, Washington State Chapter (APWA) Standard Specifications for Road, Bridge, and Municipal Construction, M41-10.

1.03 DESCRIPTION OF WORK

A. The extent and location of the demolition work are indicated on the Drawings and within these Specifications. The Work includes the requirements for the removal, wholly or in part, and disposal of all treated and untreated timber members, fences, pavements, sub-base materials, concrete ramp elements (including cast-in-place concrete and precast concrete), curbs, trees, stumps, vegetation, and other obstructions, which are designated to be demolished. The Work includes full responsibility for disposal of all demolition materials according to local, state, and federal requirements, and the Contract Documents.

B. The demolition work is included on the Drawings for guidance to indicate typical general construction features of the various types of structures and is not to be construed as definitive or adequate to supplant the actual on-site inspection by the Contractor. Demolition of the 28th Street boat launch will be considered in-water work and shall be completed in accordance with in-water work restrictions identified in the permits.

1.04 REFERENCE DRAWINGS

Reference drawings for the Phase I work are available from the Port.

1.05 JOB CONDITIONS

Access to the site is open to the public. The Contractor agrees that the premises were available prior to deadline for submission of bids.

1.06 SUBMITTALS

Submit a demolition plan that, as a minimum, discusses, describes, and addresses the following:

A. Worker safety, toolbox meetings, and signs.

B. Protection of the public.

C. Protection of workers or other persons in areas surrounding the demolition work.

D. Work sequence and schedule.

E. List of equipment to be used for demolition operations.

F. Means and methods to protect existing infrastructure and stockpile materials.

G. Environmental protection and compliance with permit requirements.

H. Disposal procedures and locations of temporary storage and/or recycling facilities.

I. Schedule of disposal site(s), their locations, and the demolition materials that will be disposed of at each site. Treated timber exposed to saltwater shall be disposed of at an approved off-site disposal facility.

PART 2 - PRODUCTS

2.01 GENERAL

Provide repair materials for patching demolished surfaces as noted on the Drawings and in these Specifications. Provide all other products that are

required to accomplish, or to be incorporated into, the Work, subject to the approval of the Port.

PART 3 - EXECUTION

3.01 DEMOLITION ITEMS

Items and categories for demolition include, but are not limited to, the following:

A. Salvage select precast reinforced concrete ramp panels as directed by the Port

B. Cast-in-place reinforced concrete slab

C. Asphalt concrete pavement

D. Sub-base materials for panels, slab, and pavement

E. Concrete barriers

F. Vegetation including trees and stumps within the project area

G. Miscellaneous utilities and other items

3.02 JOBSITE VERIFICATION

The above list is provided as a guide only and shall not be considered definitive. Verify all items for demolition and disposal.

A. Completely remove and dispose of designated structures, utilities, and other obstructions. Break up all pavement, select concrete ramp elements, concrete slabs, and curbs designated for removal, load, and dispose of according to local, state, and federal requirements. Do not damage the concrete ramp panels designated for salvage by the Port, and existing floats or abutment which will remain in place. Accomplish concrete slab and other pavement demolition by making neat vertical saw cuts at the boundaries of the area to be removed as needed. Replace materials or structures designated to remain that are damaged during the Work, at no additional cost to the Port.

B. Do not use blasting.

C. Do not allow any debris to enter the water at any time. Make all provisions as necessary using floats, falsework, scaffolding, and other

means to prevent debris from falling into the water. Remove any debris that inadvertently falls into the water, whether it sinks or floats, on an ongoing basis at no additional cost to the Port.

3.03 DISPOSAL AND CLEANUP

A. Follow the General Conditions for Construction and Similar Work of these Specifications.

B. Select concrete ramp panels that are designated for salvage shall be temporarily stored onsite until the Port transports them to their storage location.

C. After removal of demolition materials, clean and grade the area. Remove all debris, rubble, or litter from the site as a result of the demolition operations and leave the site clean.

3.04 BACKFILL AND EXCESS FILL MATERIAL

A. Backfill all areas disturbed during demolition and compact to match the elevations of the existing subbase and re-grade or re-pave as shown on the Drawings.

B. Reuse excess fill material on site or disposed of off site in accordance with these Specifications and applicable local, state, and federal regulations.

C. The Port encourages the salvage and recycling of materials from demolished structures. Salvage or recycle to the maximum extent possible, in a manner acceptable to environmental agencies and the Port, any of the materials designated for demolition and disposal.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 20 00 – Concrete Reinforcement

B. Section 03 30 00 – Cast-in-Place Concrete

C. Section 03 40 00 – Precast Concrete

1.02 DESCRIPTION OF WORK

The Work includes furnishing all necessary material, labor, and equipment for providing the structural support and physical barriers or forms which control the shape and location of the concrete. Also included in this Section are the requirements for the removal of the forms and their supports.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Concrete Institute (ACI) 301, Specifications for Structural Concrete

B. ACI 318, Building Code Requirements for Structural Concrete and Commentary

C. ACI Guide to Formwork for Concrete (ACI 347). The advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Port.

1.04 QUALITY ASSURANCE

A. Design all forms, falsework, accessories, and shoring to meet the requirements of the concrete type, sequence of placing, schedule, and other conditions of the Work. Drawings and calculations for forms, falsework, accessories, and shoring designs shall be stamped by a Professional Engineer currently registered in the state of Washington.

B. Perform inspection of all forms, falsework, accessories, and shoring before casting concrete using workers having at least 5 years of experience with the types of construction involved and the techniques necessary for completion of the Work.

1.05 SUBMITTALS

Provide documentation for paper, fiberglass, micarta, asphalt-impregnated fiber, and other miscellaneous form materials if used.

PART 2 – PRODUCTS

2.01 GENERAL

A. Materials for concrete forms may be new or used. The quality of the materials, not the age or previous usage, shall be the determining factor as to their suitability.

B. Keep forms in a condition to produce finished work meeting the location, alignment, and surface tolerances specified.

2.02 JOB-BUILT FORMS

A. Wood Forms:

1. Use framing lumber of standard dimensions and of such quality as to meet the requirements of the applied stresses or loads.

2. Use plyform Grade B-B Plywood for all exposed concrete forms.

3. Use exterior-type plywood without splits or knotholes and sanded smooth. Provide plywood with the face grain running perpendicular to the studs or joists. Use vertical or horizontal joints in surfaces of forms used on exposed surfaces. Do not use plywood less than 1/2 inch thick.

4. Use metal, fiberglass, or other special form linings where required.

B. Steel Forms:

Design and fabricate steel forms to meet the requirements of the member/members to be cast.

C. Miscellaneous Forms:

Use paper, fiberglass, micarta, asphalt-impregnated fiber, or other miscellaneous form materials only if approved by the Port prior to construction.

2.03 FORM LINERS AND COATINGS

A. Line, coat, or treat forms with a suitable release agent or bond-breaker to ensure their timely removal with no damage to the concrete.

B. Use release agents or bond-breakers that are non-coloring and that do not leave a film on the concrete surface that may inhibit subsequent finishing activities required to attain the prescribed finish.

2.04 FORM TIES AND ACCESSORIES

A. Do not use metal form ties below Mean Higher High Water.

B. Do not use wood spacers.

C. Use manufactured items for form ties, with published stress values. Provide form ties with a premeasured, break-back, weakened area so that ties can be removed approximately 1 inch from the concrete surface.

D. Use tie-rods with published stress values. Set back tie-rods for use with she-bolts a distance of 1-1/2 inches from the concrete surface.

E. Use corner brackets, friction collars, column clamps, and other specialized accessories in accordance with the manufacturer's recommendations.

2.05 FALSEWORK AND SHORING

Select and size materials and elements for shoring, falsework, or structural staging according to the Contractor's design. Furnish, erect, and brace steel scaffold-type falsework, in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.01 GENERAL

A. Set forms and falsework to allow for structural camber plus an allowance for shrinkage and settlement. Conform to the lines and grades indicated on the drawings for the finished concrete. Construct forms to be rigid,

unyielding, true to line, level, and sufficiently tight to prevent escape of mortar.

B. Place forms for openings, embedded objects, and reinforcement at the locations shown on the Drawings. Form and fasten these items securely in position to maintain minimum cover for all reinforcement, leaving smooth surfaces, true openings, accurate geometry, etc., after the forms are removed.

C. Clean forms of all material, debris, or other objects and substances deleterious to the concrete, concrete surface, or element, prior to casting.

3.02 FORM INSTALLATION

A. Prior to final setting or placing of reinforcing steel, treat forms for exposed concrete with a release agent, bond-breaker, or parting compound. Apply the compound at a rate recommended by the manufacturer, to provide a smooth surface free of dusting action caused by the chemical reaction of the compound.

B. Immediately remove any release agent or bond-breaker that comes in contact with reinforcement or embedded objects.

C. Forms may be set with a slight bevel or draft for easy removal, where approved by the Port. Use 3/4-inch chamfer strips on all exposed inside and outside corners, including the bottoms vertical faces.

D. Provide mortar-tight assembly of all forms. Do not permit standing water in the forms. Clean forms before assembly and prior to placing concrete.

3.03 FORM REMOVAL

A. Keep forms in place for a minimum of 10 days, provided the ambient temperature is 40ºF or higher.

B. Keep forms in place longer when lower temperatures (40ºF) prevail, at the Port's discretion. Disregard all time periods where the ambient temperature is below 40ºF in determining the length of time forms are to remain in place. A cold-weather concreting plan may be developed and submitted in accordance with Section 03 30 00 – Cast-in-Place Concrete, at the Contractor's expense.

C. The removal of forms as stipulated herein shall in no case relieve the Contractor of responsibility for the performance, acceptability, or finish of the Work.

D. Accomplish form and falsework removal in a manner that prevents damage to the concrete, concrete finishes, and adjacent work elements.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 10 00 – Concrete Forming and Accessories

B. Section 03 30 00 – Cast-in-Place Concrete

C. Section 03 40 00 – Precast Concrete

D. Section 05 50 00 – Metal Fabrications

1.02 DESCRIPTION OF WORK

The Work includes the requirements for manufacture, detailing, cutting, bending, transporting, handling, and placing of all concrete reinforcement and associated items required or indicated in these Specifications and on the Drawings.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Concrete Institute (ACI) 301, Specifications for Structural Concrete

B. ACI Detailing Manual including ACI 315 (ACI SP-66)

C. ACI Building Code Requirements for Structural Concrete and Commentary (ACI 318)

D. In ACI publications, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Port.

E. Specifications by ASTM International (ASTM), designated by basic reference in this Section

F. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (MSP)

G. Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge and Municipal Construction M41-10

1.04 QUALITY ASSURANCE

Provide a supervisor for the work meeting the following minimum qualifications and requirements.

A. Have a minimum of 5 years' experience in placement of reinforcing for concrete structures

B. Responsible to direct this portion of the Work

C. Present at all times during execution of this portion of Work

D. Thoroughly familiar with the type of materials being installed

E. Skilled in the required methods for installation

1.05 SUBMITTALS

A. Detailed shop drawings that are coordinated and checked for all concrete reinforcement prior to casting concrete. Do not deliver concrete reinforcement to the site prior to approval of the shop drawings. Include, but not be limited to, material specifications, bar lengths, bar bending schedules, order lists, splice lengths, and proposed splice locations on the detailed shop drawings.

B. Mill certificates for each heat of reinforcing steel, indicating specification compliance, yield strength, ultimate strength, elongation, and chemistry of steel to be furnished.

PART 2 – PRODUCTS

2.01 HANDLING

A. Protect from damage all reinforcement before, during, and after installation. Protect from damage the installed work and materials of other trades.

B. Provide reinforcement that is new and free from rust, grease, oil, wax, paint, soil, dirt, kinks, bend, or other defects. Store in a manner to prevent fouling with bond-breaking and deleterious coatings.

C. Maintain reinforcement identification after the bundles are broken.

D. In the event of damage, immediately make all repairs and replacements necessary as directed by and at no additional cost to the Port.

2.02 REINFORCING BARS

ASTM A 706, Grade 60, deformed. Hot-dip galvanize in accordance with ASTM A 767.

2.03 HEADED REINFORCEMENT

ASTM A 970 using ASTM 706, Grade 60, deformed reinforcing bars. Use only forged T-head type, with round heads and meeting the requirements of Annex A1 in ASTM A 970. Hot-dip galvanize after fabrication in accordance with ASTM A 767.

2.04 OTHER MATERIALS

Provide all other materials, not specifically described but required for complete and proper installation of reinforcement, subject to approval by the Port.

PART 3 – EXECUTION

3.01 GENERAL

A. Prior to installation of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where reinforcing installation may commence.

B. Conform to ACI 318 for details of bending, placing, and splicing of all reinforcing steel, except as modified herein.

3.02 REINFORCING STEEL BARS

A. General: Furnish all reinforcement in full lengths indicated on the Drawings.

B. Order Lists: Before ordering material, provide order lists, bending diagrams, and reinforcement placement drawings to the Port for approval. Conform to the CRSI MSP. Do not order material until approved. Approval by the Port shall in no way relieve the Contractor of responsibility for the correctness of such lists, diagrams, and drawings.

C. Fabrication: Bend all bars cold to the shapes indicated on the drawings unless otherwise approved by the Port. Do not field-bend bars partially embedded in concrete except as indicated on the drawings or as approved by the Port. Make bends and hooks in accordance with the applicable portions of the CRSI MSP.

D. Placing and Fastening:

1. Perform all placing and fastening using qualified personnel. Place all steel reinforcement accurately and hold firmly in the position indicated on the drawing during the placing and setting of concrete. Tie bars at all intersections.

2. Provide concrete cover to reinforcement as indicated on the Drawings.

3. Maintain the distance from the forms for concrete cover by means of stays, blocks, ties, hangers, or other approved supports.

   a. Use precast mortar blocks for holding reinforcement from contact with the forms of compressive strength not less than 5,000 pounds per square inch of shape and dimensions approved by the Port, or metal chairs with plastic coating as approved by the Port.

   b. Separate layers of bars by plastic chairs, by precast mortar blocks of compressive strength not less than 5,000 pounds per square inch, or by other devices approved by the Port.

   c. Provide a minimum spacing between bars of not less than one bar diameter or 1 inch minimum, but not less than 1-1/3 times the maximum size of the coarse aggregate.

4. In the event that anchor bolts, inserts, sleeves, embedded objects, headed studs, or other items interfere with placing reinforcement as indicated on the Drawings, or as otherwise required, immediately contact the Port and obtain approval of a new procedure from the Port before placing concrete.

3.03 SPLICING

Do not splice bars, except as indicated on the Drawings, without approval from the Port.

3.04 CLEANING REINFORCEMENT

Steel reinforcement, at the time concrete is placed around it, shall be free from loose rust or mill scale, oil, paint, and all other coatings, which may destroy, impair, or reduce the bond between steel and concrete.

3.05 INSPECTION

Provide inspection of all reinforcement by qualified personnel before placement of concrete. Provide access for inspection by the Port at least 48 hours in advance of any concrete pour and at no additional expense to the Port. Concrete placed in violation of this provision will be rejected. Remove rejected concrete, place new reinforcing steel, and cast new concrete at no additional expense to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 10 00 - Concrete Forming and Accessories

B. Section 03 20 00 - Concrete Reinforcement

C. Section 03 40 00 – Precast Concrete

D. Section 03 60 00 - Concrete Repair

1.02 DESCRIPTION OF WORK

The extent and location of the "Cast-in-Place Concrete" work are indicated on the Drawings. The Work includes the requirements for providing all cast-in-place concrete and associated work in conformance with the Specifications and as indicated on the Drawings.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Concrete Institute (ACI) 301, Specifications for Structural Concrete

B. ACI 305.1, Specification for Hot Weather Concreting

C. ACI 306.1, Standard Specification for Cold Weather Concreting

D. ACI 308.1, Specification for Curing Concrete

E. ACI 318, Building Code Requirements for Structural Concrete and Commentary

F. Specifications by ASTM International (ASTM), designated by basic reference in this Section

G. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, by Washington State Department of Transportation (abbreviated as WSDOT Standard Specifications)

1.04 QUALITY ASSURANCE

A. Conform to the requirements of ACI 301 for all Work, unless otherwise noted on the Drawings or in the Specifications.

B. Provide all necessary assistance to the Port for carrying out inspections and tests at no additional cost to the Port. The Port will provide for necessary inspection and testing as required, which shall be determined by the Port. The Port will make test results available at the Port office.

C. Provide concrete from ready-mixed concrete plants that are approved and certified by the National Ready Mix Concrete Association (NRMCA) or qualified by WSDOT. Batch ready-mixed concrete shall be batched in accordance with the applicable portions of ASTM C 94.

D. Provide at least one supervisor for the Work meeting the following minimum qualifications and requirements:

1. Have a minimum of 5 years' experience in placement of cast-in-place concrete for reinforced concrete structures

2. Responsible for directing this portion of the Work

3. Present at all times during execution of this portion of Work

4. Thoroughly familiar with the type of materials being installed

5. Skilled in the required methods for installation

E. Provide trained and experienced journeyman concrete finishers having at least 5 years' experience to finish all exposed surfaces.

1.05 SUBMITTALS

A. Documentation demonstrating the qualifications and experience of supervisors and directors of work, as described above.

B. Proposed concrete design mix, indicating all material contents per cubic yard of concrete, including certificates of specification compliance. Include written evidence that the ready-mix concrete plant is approved and certified by the NRMCA and other organizations.

C. Test certificates for compressive strength, yield, air content, and slump of the proposed concrete mix. Report strength test results in accordance with ACI 318, Section 1.9.

D. Certificates of compliance for mixing water.

E. Manufacturer's name, address, catalog number, and specifications for all proposed admixtures, concrete bonding agents, curing compounds, etc. Provide verification of compatibility if two or more admixtures are used.

F. Certificates of specification compliance for aggregates to be used, including aggregate alkali-silica reactivity (ASR). Identify all aggregate supply pit names and locations.

G. Proposed curing methods, including manufacturer's data for curing membranes, evaporation retardants, accelerated cure methods, etc. Submit detailed plans for concreting in ambient temperatures below 40ºF. Describe the specific methods and procedures used for substrate preparation, concrete placement, curing, and protection. Provide specific references to ACI 305.1, ACI 306.1, and ACI 308.1.

H. Shop drawings showing pour sequences, construction joints, expansion joints, etc. Include manufacturer's data for proposed pre-fabricated construction joint systems and hardware.

I. Concrete delivery tickets for each truck or batch delivered to the site. Submit delivery tickets to the Port before unloading at the site and in accordance with ASTM C 94, Section 14.

J. Proposed patching methods and materials for concrete defects.

PART 2 – PRODUCTS

2.01 CONCRETE

A. General:

1. Batch and mix all concrete at the approved ready-mix plant, unless otherwise specifically permitted by the Port. Conform to ASTM C 94 for all batching, mixing, and delivery of ready-mix concrete.

2. Proportion all cast-in-place concrete on the basis of field experience or laboratory trial mixtures according to ACI 318, Section 5.3.

B. Cementitious Materials:

1. Cement: ASTM C150, Portland cement, Type I-II or Type II. Use Portland cement with tricalcium aluminate (C3A) content between 5 and 8 percent.

2. Conform to the additional requirements of WSDOT Standard Specifications, paragraph 9-01.2(1) for Type I-II or Type II Portland cement.

3. For mixes with fly ash, use Type I-II or Type II Portland cement.

4. Fly ash: ASTM C 618, Type F, if used with added provisions that the loss on ignition shall not exceed 2 percent and that the fly ash is stored in a separate silo from that of the cement.

C. Aggregates:

1. Aggregates: ASTM C 33. Use coarse and fine aggregates consisting of hard, tough, durable particles free from foreign and deleterious materials. Store aggregates in such a manner as to prevent segregation, fracture, breakage, or the introduction of foreign material.

2. Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C 1260 or ASTM C 1293. Test both coarse aggregate size groups if from different sources. Evaluate the fine and coarse aggregates in combination, which matches the proposed mix design proportioning. Test results of the combination shall have a measured expansion equal to or less than 0.10 percent at 16 days after casting when aggregates are tested in accordance with ASTM C 1260 or 0.04 percent for aggregates tested in accordance with ASTM C 1293.

3. Aggregate Grading: WSDOT Standard Specifications paragraph 9-03.1(5), Combined Aggregate Gradation for Portland Cement Concrete. Use a nominal maximum aggregate size of 3/4 inch unless otherwise approved by the Port.

4. Limit the maximum size of coarse aggregate to the smaller of three-fourths of the minimum clear spacing between reinforcing bars, the spacing between reinforcing bars and side forms, and the spacing between reinforcing bars and top or bottom surface of the concrete.

5. Do not use lightweight aggregate.

D. Mixing water for concrete: WSDOT Standard Specifications, paragraph 9-25.1 and the requirements from ASTM C 1602 Table 2. For Table 2, limit chloride content as Cl- to 500 parts per million. Do not use water from mixer washout operations for mixing water.

E. Admixtures: Use admixtures supplied by one manufacturer and approved by the Port.

1. Air-entraining admixtures: ASTM C 260. Use dosage rates in accordance with manufacturer's recommendations.

2. Water-reducing admixtures: ASTM C 494. Use dosage rates in accordance with the manufacturer's recommendations.

3. Do not use admixtures containing calcium chloride.

4. If two or more admixtures used, verify compatibility in accordance with ASTM C 1679.

2.02 OTHER MATERIALS

Provide all other materials not specifically described but required for a complete, durable, and functional installation of cast-in-place concrete as specified herein, and subject to Port approval.

2.03 MIX PROPORTIONS AND STRENGTH

A. Unless otherwise indicated, concrete minimum 28-day compressive strength shall be 5,000 psi.

B. Proportion the mix to produce a mixture that will readily work into all corners, sides, and angles of the forms, around reinforcement and embedded items, with no segregation, and prevent free water from collecting on the surface.

C. Select mix proportions in accordance with ACI 318.

1. Test data representing thirty recent consecutive tests for each design shall be submitted to establish the standard deviation used in ACI 301 Section 4.2.3.5.

2. The criteria for acceptance of submitted tests shall be accordance with ACI 301 Section 4.2.3.1. The second sentence shall be amended to read, "…class of concrete within 500 psi of that specified for the work", instead of 1000 psi.

3. Where 30 recent consecutive tests are not available, the standard deviation may be determined by records based on no less than 15 tests as described in ACI 301 Section 4.2.3.3.

4. Where no previous data are available, the mix or mixes shall be overdesigned in accordance with ACI 301 Section 4.2.3.1.

5. When consecutive test data have been established during the project the overdesign criteria may be relaxed in accordance with ACI 301 Section 4.2.3.5.

6. Do not deviate from any reviewed design mix without written approval of the Engineer.

D. Concrete shall meet the following requirements:

1. Minimum Cementitious Material

Cement without fly ash	6.5 sacks/cubic yard
Cement with fly ash	6 sacks/cubic yard and 100 pounds fly ash/cubic yard

2. Maximum Water/Cement Ratio = 0.40
(by weight, including free moisture on aggregate. If fly ash is used, calculate the water/cement ratio as the weight of water divided by the weight of cement plus the weight of the fly ash)

3. Air Content = 3.5 percent to 6.5 percent

4. Water-reducing Admixture: Type A, D, F, or G. Provide an amount to control the desired workability and water/cement ratio of the mix and shall be within the manufacturer's recommended range.

5. Slump: 3 to 5 inches with Type A or D admixtures, 4 to 8 inches with Type F or G admixtures. Select the slump to enhance workability without violating the maximum water/cement ratio requirement.

PART 3 – EXECUTION

3.01 PREPARATORY WORK

A. General:

1. Prior to casting, inspect the installed work of all other trades and verify that such work is complete to the point where this installation may commence.

2. Verify that all items to be embedded in concrete are in place, properly oriented, located, and secured.

3. Verify that concrete may be placed to the lines, grades, and elevations indicated on the Drawings with all required clearances for reinforcement and embedded items.

4. Thoroughly clean all areas in which concrete is to be placed to remove all wood debris, sawdust, form tie cuttings, and all deleterious material. Bend back ends of tie wires so they do not encroach into the specified clear cover of the concrete. Thoroughly wet (with clean, freshwater) concrete forms, which have not been treated with oils, waxes, or other bond breakers, just prior to placing concrete.

5. When new concrete is to be cast adjacent to existing concrete or concrete from a previous pour, clean and roughen all existing concrete or concrete from a previous pour, and provide a bondable surface. Provide 1/4-inch amplitude on the roughened surface, continuous across the entire surface.

6. Clean transporting and handling equipment of all hardened concrete.

B. In the event of deviations discrepancies with the requirements of this Section, immediately notify the Port. Do not proceed with installation until all deviations or discrepancies have been resolved by the Port.

C. Notification: Notify the Port at least 48 hours in advance of any concrete pour. Notify the Port when inspection by the Contractor is complete.

3.02 TRANSPORTING AND PLACING CONCRETE

A. General:

1. Do not use concrete that does not reach its final position in the forms within 1-1/2 hours after the addition of cement. During hot weather, this time limit shall be reduced in accordance with ACI 305.1.

2. Place concrete as soon as possible after mixing. Do not re-temper or remix concrete, which has developed initial set or partially hardened.

3. Use methods and manners of placing concrete that do not allow segregation of the aggregates or displacement of reinforcement and embedded objects.

4. Use methods of depositing and compacting concrete that produce compact, dense, and impervious concrete with the required surface finishes and no segregation.

5. Remove defective concrete as determined and directed by the Port and at no additional cost to the Port.

6. Discard the pump priming slurry, if a concrete pump is used as the placing system, before placement into the forms. Initial acceptance testing may be delayed until the pump priming slurry has been eliminated. Do not use a pump that allows free water to flow past the piston. Do not use aluminum conduits or aluminum tremies.

7. Place concrete in continuous horizontal layers not exceeding 18 inches and compact so that there is no line of separation between layers. Fill each part of the forms by depositing concrete directly at or near as possible to the final destination.

8. Do not deposit concrete by dropping more than 5 feet into the forms. Also use approved conduit to place concrete in sloping forms or in other locations, as directed by the Port, to prevent concrete from sliding around reinforcing steel or other embedded objects.

9. During pile driving or other vibratory activities that may disturb the initial set of the concrete and its bond to the reinforcing steel, do not place concrete within 100 feet of the activity, and do not perform or

resume the activity within 100 feet until a minimum of 3 days after initial concrete set.

10. Do not allow concrete to fall in the water or on the bank anywhere in the project area.

B. Hot/Cold Weather Placement: Do not place concrete on frozen ground or against frosted reinforcing steel or forms. Do not mix or place concrete while the atmospheric temperature is below 40°F. If air temperature exceeds 90˚F, provide water spray or other approved methods to cool contact surfaces to less than 90˚F. Follow the respective recommendations in ACI 305.1 and ACI 306.1.

C. Do not place concrete under water unless placed within the confines of a watertight compartment, such as a pipe pile. Submit method of placement, forms, confining structure, special concrete mix, and all equipment to the Port for approval.

D. Consolidation of Concrete:

1. Provide appropriately sized and functional internal vibrators for use in compacting all concrete except that which is placed under water. Use vibrators of the type designed to be placed directly in the concrete, and their frequency of vibration shall not be less than 7,000 impulses per minute when in actual operation.

2. Provide a level of vibration such that the concrete becomes uniformly plastic. Insert vibrators to a depth sufficient to vibrate the bottom of each layer effectively, but do not penetrate partially hardened concrete. Do not apply the vibrators directly to steel, which extends into partially hardened concrete. Use intervals between points of insertion between 2 feet and 3 feet.

3. Do not continue vibration in any one spot if pools of grout or water are formed. In vibrating and finishing top surfaces, which are exposed to weather or wear, do not draw water or laitance to the surface.

4. Do not use vibrators to transport or move concrete inside the form.

5. Provide a sufficient number of vibrators to effectively vibrate all of the concrete placed. Use hand-tamping wherever necessary to secure smooth and dense concrete on outside surfaces.

3.03 CONSTRUCTION JOINTS

A. Provide joints and stoppages, except as specifically shown on the Drawings, conforming to ACI 318. Do not use wire mesh or similar materials.

B. Submit for approval all requests for additional, deleted, or relocated construction joints. Locate joints so as not to impair the strength or durability of the concrete or structure and only as approved by the Port. Changes as a result of such requests shall be at no additional cost to the Port.

C. Thoroughly clean and roughen, as specified herein, all joint surfaces using high-pressure water blasting and remove loose concrete, gravel, sediment, laitance, and all other deleterious substances.

D. Thoroughly wet and condition all joint surfaces to a saturated surface dry (SSD) condition prior to placing fresh concrete and maintain the wetting and conditioning overnight.

E. At horizontal surfaces of construction joints between stages of concrete in pile cap pours, provide clean and roughened surfaces as specified herein.

F. Unless otherwise noted, joints requiring roughened surfaces shall have grooves 1/2 inch to 1 inch wide, 1/4 inch to 3/8 inch deep, spaced at twice the width of the groove.

3.04 CURING CONCRETE

A. Follow ACI 308.1.

B. Maintain concrete, above 40°F and in a moist condition for at least the first 10 days after placement.

C. Do not use curing compounds on surfaces to receive additional concrete.

D. Where allowed, apply an ASTM C 309, Type 1, Class A or B curing compound to the fresh concrete immediately after finishing the concrete and as soon as the visible bleed water has evaporated or as directed by the Port. Apply according to the manufacturer's recommendations. However the rate of coverage shall be at least 1 gallon per 100 square feet and be sufficient to effectively obscure the original color of the concrete.

E. Apply the curing compound in two applications to ensure full coverage of the concrete, with the second coat applied in a direction perpendicular to that of the first application.

F. Do not apply curing compound to construction joint surfaces. Completely remove curing compound on construction joints, reinforcing steel, or embedments immediately.

G. Supply backup spray equipment and sufficient workers to apply the curing compound in accordance with the Specifications.

H. No more than 12 hours following the application of the curing compound, cover the top surfaces with cotton mats, an approved vapor proof curing paper, or white polyethylene sheeting. If the covering used is sand or cotton mats, keep them continuously wet, day and night, for the period of time specified above, and if curing paper or plastic film is used, leave them in place for the same length of time.

I. Keep curing paper and white polyethylene sheeting tightly in place by taping and weighting joints, or other methods for the prescribed length of curing period.

J. Do not use membrane curing compounds, which leave a waxy film on the concrete.

K. Protect all concrete from damage and accelerated drying. Do not allow fire or heat sources above 120 degrees Fahrenheit near the concrete at any time.

L. Wet burlap or other moist cure methods may be used in place of curing compounds as approved by the Port. It is preferable to use wet or moist cure methods on surfaces that will receive additional concrete. Use wet/moist cure methods continuously for the prescribed duration of the curing period.

3.05 FINISHING CONCRETE

A. General:

1. Keep all permanently exposed surfaces free from local bulging. Remove ridges or lips to leave a smooth, flat surface. Apply/install patching mortar as directed by the Port, of the same color as the surrounding concrete. Add white Portland cement to the patching mortar for color matching with adjacent concrete.

2. Protect finished surfaces from damage, stains, and abrasion. Repair surfaces or edges damaged during construction at no additional cost to the Port.

3. Immediately after removal of forms or form linings, inspect the concrete surfaces for defects, holes, cracks, spalls, and irregularities.

4. Repair all defects (as defined below), defective concrete, form tie holes, and tie-rod holes immediately after the forms are removed unless otherwise directed by the Port. Remove exposed tie wires (chip out if necessary) to a minimum depth of one inch and patch the resulting holes. For patching the holes, use BASF EMACO R350 CI or a cementitious mortar approved by the Port, applied in accordance with the manufacturer's instructions by experienced and qualified personnel.

B. Defects are defined as follows:

1. Surface defects, including honeycomb, rock pockets, spalls, chips, air bubbles, voids, pinholes, bug holes, and indentations greater than or equal to 1/4 inch in depth, or greater than or equal to 1/2 inch in width, length, or diameter.

2. Surface cracks greater than or equal to 0.007 inch in width.

3. Surface irregularities, including embedded objects, embedded debris, lift lines, sand lines, bleed lines, segregation, form pop-outs, fins, form leakage, texture irregularities, stains, and other discolorations that cannot be removed by water blast cleaning.

4. Repair all defects as directed in Section 03 60 00 – Concrete Repair and as directed by the Port. Repair of defects shall be at no additional cost to the Port.

C. Unformed Surfaces: Follow ACI 301. Provide a steel troweled and broom finish for abutment deck surface. Orient slip resistant broom finish transverse to abutment orientation. Use a surface stria between 1/16-inch and 1/8-inch. Provide a 3/8 in. tooled radius with a minimum 1 1/2 in. wide, smooth, hard steel finished face at all deck edges.

D. Formed Surfaces: Follow ACI 301 and provide a Surface Finish 3.0. Use form-facing material that produces a smooth, hard, uniform texture. Minimize the number of seams. Do not use material with raised grain, torn

surfaces, worn edges, patches, dents, or other defects which would impair the texture of the concrete surface.

3.06 TESTING

A. Testing of concrete will be performed by a testing agency retained by the Port. Testing will conform to ACI 301 for methods of sampling, testing, evaluation, and acceptance.

B. Testing as described above and on the drawings will be at the Port's discretion and in no way relieves the Contractor of its quality control obligations.

C. The Contractor shall institute a quality control program to assure that the specified quality of materials and work are provided and perform required tests to support quality control obligations.

D. Tests performed by the Port will be done at no cost to the Contractor, except as noted below.

1. Additional testing and inspection required because of changes in materials, proportions, and procedures requested by the Contractor.

2. Additional testing of materials or concrete that either fails to meet the specification requirements or when tested in accordance with the ACI references outlined.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 10 00 – Concrete Forming and Accessories

B. Section 03 20 00 – Concrete Reinforcement

C. Section 03 30 00 – Cast-in-Place Concrete

D. Section 03 60 00 – Concrete Repair

E. Section 05 50 00 – Metal Fabrications

1.02 DESCRIPTION OF WORK

The extent and location of the “Precast Concrete” work are indicated on the Drawings. The Work includes furnishing of all necessary material, labor, and equipment for providing precast concrete members, including manufacture, transportation, erection, and other related work, as required for a complete installation in conformance with these Specifications and as indicated on the Drawings.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Concrete Institute (ACI) 301, Specifications for Structural Concrete

B. ACI 305.1, Specification for Curing Concrete

C. ACI 318, Building Code Requirements for Structural Concrete and Commentary

D. Specifications by ASTM International (ASTM), designated by basic reference in this Section

E. Precast/Prestressed Concrete Institute (PCI) MNL-116, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products

1.04 QUALITY ASSURANCE

A. Manufacturer: A company specializing in providing precast concrete products and services normally associated with the industry for at least 5 years unless otherwise approved by the Port. Upon request by the Port, make the manufacturing facility available for inspection.

B. Precast concrete materials, manufacturing, testing, quality control, record keeping, and product tolerances shall be in accordance with the provisions of PCI MNL-116.

C. The Port may inspect some or all precast members at the casting yard. All damaged and/or otherwise defective members shall be rejected.

D. Erection: Demonstrate experience erecting members similar to those required for this project.

1.05 SUBMITTALS

A. Complete plant quality control plan including specific references to PCI MNL-116 provisions and proof of PCI plant certification. Submit written evidence to the Port to show experience, qualifications, and adequacy of plant capability and facilities for performance of contract requirements, including proof of plant certification by PCI.

B. Complete shop drawings indicating all shop and erection details, including position and quantities of reinforcing steel, inserts, member geometry, etc. Indicate the concrete compressive strength and material stresses at the various stages of manufacture, handling, and erection. Provide supporting calculations for handling and delivery stress calculations for each member.

C. Proposed concrete mix design, indicating material contents per cubic yard, including test certificates for compressive strength, yield, air content, slump, admixtures, etc. Include manufacturer's data sheets for all proposed admixtures, release agents, curing compounds, epoxy grout, etc.

D. Record of the actual curing temperature regime and cast date for each member.

E. Mill certificates indicating specification compliance regarding strength and chemistry of reinforcing steel to be furnished.

F. Certificates indicating specification compliance of constituent concrete materials, including alkali-silica reactivity (ASR) for aggregates.

PART 2 – PRODUCTS

2.01 CONCRETE

See Section 03 30 00 – Cast-in-Place Concrete. Develop the minimum 28-day compressive strength as indicated.

2.02 OTHER MATERIALS

A. For reinforcement, see Section 03 20 00 – Concrete Reinforcement.

B. For embedments, see Section 05 50 00 – Metal Fabrications.

PART 3 – EXECUTION

3.01 FABRICATION

A. Use manufacturing procedures complying with PCI MNL-116.

B. Formwork: See Section 03 10 00 – Concrete Forming and Accessories. Construct forms to maintain units within specified tolerances and to withstand tensioning and detensioning operations. Thoroughly clean forms after each use.

C. See Section 03 30 00 – Cast-in-Place Concrete, for mixing, placing, consolidating, and repair requirements.

D. Locate lifting devices on the tops of members only. Detail lifting devices so that the concrete cover over the portion of lifting device to remain equals or exceeds concrete cover for reinforcing steel in the member.

E. Do not use accelerated curing methods.

F. Use a maximum curing temperature of 150°F.

G. Leave areas to receive additional concrete clean and rough with an amplitude of 1/4 inch. Provide a wood float finish at all other exposed surfaces unless otherwise indicated in these specifications or on the drawings. Provide a smooth dense steel-formed surface free of defects, abrasions, voids, stains, etc. at all formed surfaces.

H. Manufacturing Tolerances:

1.	Length	+3/4 inch, -0 inch
2.	Width	+1/4 inch, -0 inch
3.	Thickness	+1/4 inch, -0 inch
4.	Horizontal alignment (sweep) over member length	1/4 inch maximum
5.	Differential camber between adjacent members	1/4 inch maximum

I. Product Identification Number: Mark each member using a permanent system that includes, as a minimum, the member type, cast date, cast length, and casting number.

3.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling:

1. Lift and support members during manufacturing, stockpiling, transporting, and erection operations only at the lifting or supporting points, or both, as shown on the approved shop drawings.

2. Perform transportation, site handling, and erection with industry standard equipment and methods, and by qualified personnel having a minimum of 5 years of similar experience.

3. Do not damage members during handling and delivery operations. Do not overstress, crack, damage, fracture, or produce impact on the members. Repair all damaged members at no cost to the Port using repair methods in accordance with Section 03 60 00 – Concrete Repair. Remove and replace members damaged beyond repair, as determined by the Port, and at no additional cost to the Port.

B. Storage:

1. Store all members off the ground.

2. Place stored members so that identification marks are discernible.

3. Separate stacked members by battens across full width of each bearing area.

4. Stack so that lifting devices are accessible and undamaged.

5. Store members on level ground using timber blocking so that the axis of each member is maintained in a straight line and that bending stresses are not produced. Locate the blocking of successive tiers exactly above the blocking of the lower tiers.

3.03 ERECTION

A. Preparation: Provide straight-graded or level bearing surfaces on all field-placed supporting members as indicated on the Drawings.

B. Erection: Do not place members until the concrete has attained the minimum specified compressive design strength and only after a minimum of 21 days after casting.

C. Installation: Lift members with suitable lifting devices at points provided by the manufacturer. Set members as indicated on the Drawings. Keep members stable. Align and level, or grade, members as required.

D. Cut off lifting devices and patch with specified repair mortar.

E. Inspection: After installation, precast members will be inspected by the Port at its discretion. Provide access to the Port for these inspections at no additional cost to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 30 00 – Cast-in-Place Concrete

B. Section 03 40 00 – Precast Concrete

C. Section 05 50 00 – Metal Fabrications

1.02 DESCRIPTION OF WORK

The Work includes furnishing of all necessary material, labor, and equipment for repairs to cast-in-place concrete and precast concrete members.

1.03 REFERENCES

Specifications by ASTM International (ASTM), designated by basic reference in this Section. Use the most current edition at the time of bid unless otherwise indicated.

1.04 QUALITY ASSURANCE

A. Provide all necessary assistance in testing of materials and provide access for testing and inspection at no additional expense to the Port.

B. Provide at least one person who shall be present at all times during execution of the work, who shall direct all work performed, and who has at least 5 years experience with the materials and the methods of installation necessary to meet the requirements of this Section.

1.05 SUBMITTALS

A. Manufacturer's name, address, catalog cuts, and specifications for each repair material.

B. Manufacturer's test certificates for grout compressive strength and non-shrink characteristics of proposed cementitious materials. Indicate the working time, fluid consistency, flow rate, and manufacturer's recommended installation temperatures.

C. Manufacturer's recommendations for application of each repair material.

1.06 PRODUCT HANDLING

Provide and maintain one set of current manufacturer's safety data sheets (MSDS) for each material being used on site. Comply with MSDS requirements.

PART 2 – PRODUCTS

2.01 REPAIR MORTAR

A. For hand-troweled applications, EMACO S88 CI manufactured by BASF Construction Chemicals LLC, Sika Repair SHB manufactured by Sika Corporation, or equal approved by the Port.

B. For form and pump or form and pour applications, EMACO S66 CI manufactured by BASF Construction Chemicals LLC, Sika Monotop 611 manufactured by Sika Corporation, or equal approved by the Port.

C. Locations: Repairs to new or existing concrete construction; defects or damage identified in Section 03 30 00 – Cast-in-Place Concrete; defects or damage identified in Section 03 40 00 – Precast Concrete, and other locations as identified by the Port.

2.02 CRACK REPAIR

A. Provide products appropriate for the specific defect and are subject to the approval of the Port selected from the following.

1. EpoXeal GS Structural, by BASF Construction Chemicals LLC, Shakopee, MN.

2. SCB Concresive 1350, by BASF Construction Chemicals LLC, Shakopee, MN.

3. SCB Concresive 1360, by BASF Construction Chemicals LLC, Shakopee, MN.

4. Sikadur 35, Hi-Mod LV, by Sika Corporation, Lyndhurst, NJ.

B. Locations: Repairs to new or existing concrete construction; defects or damage identified in Section 03 30 00 – Cast-in-Place Concrete; defects or damage identified in Section 03 40 00 – Precast Concrete, and other locations as identified by the Port.

PART 3 – EXECUTION

3.01 GENERAL

A. Follow these recommendations unless superseded by the manufacturer's written instructions.

B. Store, mix, and place products in accordance with the manufacturer's published specifications.

C. Remove unsound concrete with saws, chipping hammers, and/or hydrojetting tools as required. Make saw cuts 1/2-inch deep around the perimeter of unsound concrete area. Use either a square or rectangular sawcut perimeter in shape to the maximum extent practicable. The entire saw cut shall be made in sound concrete. Determine the depth of the reinforcing bar cover in the spall area prior to saw cutting. Reduce the depth of saw cut, where required, to avoid cutting embedded reinforcing steel. Chip concrete at those locations to provide sharp edges. Do not "feather edge" the repair perimeter. Where a reinforcing bar is exposed by removal of unsound concrete, remove additional concrete around the reinforcing bar to provide at least 1 inch clear space around the bar circumference. Do not damage sound concrete adjacent to repair area, embedded reinforcing steel, or embedments. Replace reinforcement or embedments damaged during sawing or concrete removal at no additional cost to the Port.

D. Repair cracks visible in the substrate after concrete removal in accordance with the manufacturer's recommendations. Crack repair shall be completed prior to installation of concrete repair mortar.

E. Sandblast or high-pressure water-blast all exposed embedded reinforcing steel to remove unsound concrete, particularly behind exposed reinforcing bars. Where reinforcing steel is broken or missing, install supplemental bars and lap as directed by the Port. Locate supplemental reinforcing bars to provide a minimum cover of repair mortar to match the existing concrete profile. Perform additional concrete chipping, as directed by the Port, to provide the required cover over bars.

F. Sandblast or high-pressure water jet the cavity and the immediate surrounding concrete area to remove any deleterious materials including laitance or loose concrete. Provide a surface roughness of the cavity to a full amplitude of 1/4 inch. Blow the cavity clean with dry oil-free compressed air to ensure that all loose particles have been removed.

G. Predampen the cavity surface with clean water to a saturated surface dry condition with no freestanding water prior to when the repair mortar is placed.

3.02 CONCRETE REPAIR WITH REPAIR MORTAR

Perform repairs in accordance with manufacturer's recommendations, including time of application with respect to age of concrete, mixing, application, finishing, and curing. Notify the Port of all proposed repair procedures and provide manufacturer's recommendation to the Port at least 2 weeks before performing repairs.

3.03 CRACK REPAIR

Perform repairs in accordance with manufacturer's recommendations, including time of application with respect to age of concrete, mixing, application, and curing. Notify the Port of all proposed repair procedures and provide manufacturer's recommendation to the Port at least 2 weeks before performing repairs.

3.04 INSPECTION

In the presence of the Port, sound each repair area with a sounding bar or hammer after sufficient curing per manufacturer's recommendations. Correct any hollowness, as determined by the Port, by removing and replacing the unbonded repair mortar at no additional cost to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 30 00 – Cast-in-Place Concrete

B. Section 03 40 00 – Precast Concrete

C. Section 03 60 00 – Concrete Repair

D. Section 09 96 00 – High Performance Coatings

E. Section 35 51 13 – Precast Concrete Floats

1.02 DESCRIPTION OF WORK

The extent and location of the metal fabrication work are indicated on the Drawings and in the Specifications. The Work consists of furnishing all materials, labor, and equipment for fabricating and/or repairing, galvanizing, and erecting metal fabrications, in accordance with the Drawings and these Specifications. Metal fabrications include fabrications of structural steel.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Galvanizers Association (AGA), Quality Assurance Manual

B. American Institute of Steel Construction (AISC), Specification for Structural Steel Buildings (AISC 360)

C. AISC Code of Standard Practice for Steel Buildings and Bridges (AISC 303)

D. Specifications by ASTM International (ASTM), designated by basic reference in this Section

E. American Welding Society (AWS) D1.1, Structural Welding Code – Steel

F. AWS A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination

G. Society for Automotive Engineers (SAE) Specifications

H. Society for Protective Coatings (SSPC), Surface Preparation Specifications

I. Washington Association of Building Officials (WABO) Standard No. 27-13, WABO Welder and Welding Operator Performance Qualification Standard for Structural Steel, Sheet Steel, and Reinforcing Steel

1.04 QUALITY ASSURANCE

A. Fabricator: Demonstrate a minimum of 5 years experience fabricating and working similar metals and configurations, including cutting, bending, forming, welding, and finishing.

B. Welders: Currently certified by AWS and WABO for structural welding.

C. Welding: Procedures, operations, welders, and tackers shall be qualified in accordance with AWS D1.1.

D. Galvanized Coating Applicator: Specialize in hot-dip galvanizing after fabrication and follow the procedures in the AGA Quality Assurance Manual.

E. Perform visual inspection and nondestructive testing (NDT) and inspection of all shop and field welds in accordance with AWS D1.1. Repair or replace welds failing to comply at no additional cost to the Port.

1.05 SUBMITTALS

A. Detailed and coordinated shop drawings indicating all shop and erection details, including dimensions, cuts, copes, connections, holes, fasteners, material specifications, welds, surface preparations, and finishes.

B. Welder qualifications and certifications.

C. Weld Procedure Specifications (WPSs) proposed for use on the project. Include supporting Procedure Qualification Records (PQRs) for all WPSs not prequalified by AWS.

D. Galvanized coating applicator's Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A 123, A 153, or F 2326 as applicable.

E. Mill certificates for each heat number of structural steel, miscellaneous steel, and grating.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide new materials, free from oxidation, corrosion, and defects, and of the specified quality.

B. Protect all materials and fabrications from damage before, during, and after installation. Protect against damaging the installed work of other trades.

C. Protect galvanized finishes and painted coatings from damage by use of padded slings, straps, and other means.

D. In the event of damage, immediately make all repairs and replacements, as approved by the Port, and at no additional cost to the Port.

2.02 STRUCTURAL STEEL

A. Plates and Bars: ASTM A 572, Grade 50, unless noted otherwise.

B. Angles and Channels: ASTM A 36

C. Wide Flange Shapes: ASTM A 992

D. HSS Sections: ASTM A 500, Grade C

E. Pipe: ASTM A 53, Grade B

2.03 BOLTS, NUTS, AND WASHERS

A. Anchor bolts and anchor rods: ASTM F 1554, Grade 105, headed, unless noted otherwise.

B. Economy bolts, hex head bolts, and other bolts not specified as high strength: ASTM A 307, Grade A.

C. Nuts and washers for economy bolts, hex head bolts, and other bolts not specified as high-strength: ASTM A 563 nuts, suitable for the grade of bolt, ASTM F 844 plain washers, wide series, maximum thickness.

D. High-strength bolts, nuts, and washers: ASTM A 325-X, Type 3, ASTM A 563-DH, zinc coated, and ASTM F 436, zinc coated, respectively.

E. Couplers: SAE Grade 5, heavy hex.

2.04 OTHER MATERIALS

All other materials not specifically described but required shall be proposed by the Contractor, new, free of corrosion, and subject to the approval of the Port.

PART 3 – EXECUTION

3.01 PREPARATORY REVIEW

A. Prior to all work of this Section, inspect the installed work of all other trades affecting this work and verify that all such work is complete to the point where this installation may properly commence.

B. Coordinate and furnish placement drawings, templates, instructions, and directions for installation of all items.

C. Verify that the work can be fabricated and installed in accordance with the Drawings, Specifications, and Reference Standards. Immediately report discrepancies to the Port and do not proceed with fabrication or installation until discrepancies are resolved and direction is provided.

3.02 FABRICATION – GENERAL

A. Fabricate all structural steel and miscellaneous steel in accordance with the approved shop drawings and Reference Standards.

B. Shop-fabricate and preassemble all items complete for installation to the maximum extent practicable to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations.

C. Unless otherwise indicated on the Drawings, weld all shop connections. Provide joints that are tight fitting, securely fastened, square, plumb, straight, and true.

D. Drill or punch all holes required for attachments and bolted connections, including those of other trades.

E. Do not burn holes.

F. Conform to AWS D1.1 for all welding.

3.03 FABRICATION – HANDRAILS

A. In addition to the paragraph "FABRICATION – GENERAL", follow these requirements.

B. Provide the same size top rails as posts.

C. Provide mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce them by tight fitting interior sleeves not less than 6 inches long. Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

3.04 PROTECTIVE COATINGS

A. Hot-dip galvanize all miscellaneous metal, metal fabrications, and fasteners, except as noted in this Section or on the drawings, in conformance with ASTM A 123, A 143, A 153, A 384, A 385, and F 2329.

B. Identify proposed drain holes or vent holes required to produce galvanized coatings to the specified standards. Clearly locate these holes on the shop drawings.

C. Galvanize items, to the extent practicable, immediately after fabrication is complete.

D. Prepare galvanized surfaces to be coated with a high-performance coating in accordance with Section 09 96 00 – High Performance Coatings.

E. Restore damaged galvanizing, including damage due to welding, in accordance with ASTM A 780 using zinc-based alloys per Annex A1. Do not use zinc-rich paints. Prepare the surface and apply alloys in accordance with the manufacturer's specifications.

3.05 INSTALLATION AND ERECTION

Install and erect all miscellaneous metal and metal fabrications in accordance with the Drawings, shop drawings, and Reference Standards.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

The provisions and intent of the contract including the General Conditions, Supplementary Conditions, and General Requirements, apply to the Work as if specified in this Section. Work related to this Section is described in:

A. Section 02 41 00 – Demolition

B. Section 05 50 00 – Metal Fabrications

C. Section 31 62 00 – Steel Pipe Piles

1.02 DESCRIPTION OF WORK

The extent and location of rough carpentry are indicated on the Drawings. The Work shall consist of furnishing all labor, material, and equipment for furnishing and installing timber, in accordance with the Drawings and these Specifications. Field-verify all dimensions for materials to be furnished, including verification of member sizing prior to order materials. The Work also includes furnishing and installing composite plastic shim materials with the timber construction.

1.03 QUALITY ASSURANCE

A. Provide a supervisor for the Work meeting the following minimum qualifications and requirements:

1. Have a minimum of 5 years' experience in the repair and construction of marine timber structures with similar details

2. Responsible to direct this portion of the Work

3. Present at all times during execution of this portion of Work

4. Experienced with the type of materials being installed

5. Skilled in the required methods for installation

B. Provide skilled workers who are familiar with the Work involved and the techniques required for the proper execution of the Work.

1.04 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. National Design Specification (NDS) for Wood Construction, American Wood Council (AWC)

B. West Coast Lumber Inspection Bureau (WCLIB), Standard Grading Rules for West Coast Lumber - No. 17

C. American Wood Protection Association (AWPA), Wood Preservative Standards

D. Western Wood Preservers Institute (WWPI), Best Management Practices (BMPs) for the Use of Treated Wood in Aquatic Environments and Wetland Environments

1.05 PRODUCT HANDLING

A. Store all timber off ground and protect from moisture by canvas or plastic covers, but provide ventilation.

B. Handle and care all treated timber in accordance with AWPA M-4.

1.06 SUBMITTALS

A. Order list for pile caps, related elements, and other required materials

B. Certificates of treatment and BMPs to be used

PART 2 – PRODUCTS

2.01 GENERAL

Provide new products only, unless otherwise indicated on the Drawings.

2.02 GRADE STAMPS

Identify all stress-graded lumber by the WCLIB grade stamp or the grade stamp of another inspecting agency as approved by the Port.

2.03 LUMBER, TIMBER, AND PLYWOOD

A. Consider all lumber and timber as timber with respect to this Section unless otherwise noted.

B. Use Pacific Coast Douglas fir, Grade No. 1 or better, conforming to the dressing and grading rules of the referenced standard.

C. Surface all timber as noted on the Drawings. Where not noted, surface four sides.

2.04 PRESERVATIVE TREATMENT

A. Pressure treat all timber in accordance with AWPA T1, U1, and UC4B, with a minimum retention of 0.60 pound of ammonical copper zinc arsenate (ACZA) per cubic foot.

B. Pressure treat all shims in accordance with AWPA Standards T1, U1, and UC4A, with a minimum retention of 0.4 pound per cubic foot of ACZA.

C. Store, handle, care, and field treat all treated timber in accordance with AWPA Standard M4.

D. Perform post-treatment procedures for timber in accordance with WWPI BMPs.

2.05 HARDWARE

A. For bolts and miscellaneous hardware, use all new materials, conforming to product specifications and reference standards of Section 05 50 00 – Metal Fabrications, except as noted on the Drawings.

B. Providea malleable iron washer under all nut and bolt heads (except under heads of economy bolts) bearing on timber.

C. Hot-dip galvanize all hardware, as specified above, including nails, spikes, and lag screws, conforming to the requirements of Section 05 50 00 – Metal Fabrications.

PART 3 – EXECUTION

3.01 PREPARATORY REVIEW

A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may commence and be performed in accordance with the Drawings and this Section.

B. Prior to ordering timber materials, verify measurements in the field, including any member designated for replacement. Establish order lengths using the actual measured lengths plus any additional length to ensure a tight fitting in the field.

3.02 FABRICATION AND HANDLING

Follow AWPA M-4 for the care, handling, and field treatment of pressure-treated timber.

3.03 INSTALLATION

A. Perform all work in accordance with standard industry practices for marine timber construction and in a manner to achieve the tolerances specified.

B. Confine all handling of treated timber with pointed tools to ends. Use soft lines or straps for slings to handling timbers, do not use steel cable.

C. Fastening

1. Drill holes for bolts 1/16 inch larger than the bolt.

2. Prebore lead holes for drift pins and spikes to 75 percent of the fastener shank diameter.

3. Prebore lead holes for lag bolt locations to 65 percent of the shank diameter.

4. Use washers under all bolt heads and nuts bearing on wood.

5. Swab cut ends and holes bored in pressure-treated material with a material equal to the original preservative treatment. Provide three coats of preservative treatment and allow each coat to dry before applying subsequent coat.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

The provisions and intent of the contract including the General Conditions, Supplementary Conditions, and General Requirements, apply to the Work as if specified in this Section. Work related to this Section is described in:

A. Section 05 50 00 – Metal Fabrications

B. Section 35 51 13 – Precast Concrete Floats

1.02 DESCRIPTION OF WORK

The extent and location of conditions requiring structural composites are indicated on the Drawings. The Work shall consist of furnishing all labor, material, and equipment for furnishing and installing structural composites, in accordance with the Drawings and these Specifications. Field-verify all dimensions for materials to be furnished, including verification of member dimensions and thicknesses prior to ordering materials. The Work also includes providing composite plastic pile shim materials for the grounding structure.

1.03 QUALITY ASSURANCE

A. Provide a supervisor for the Work meeting the following minimum qualifications and requirements:

1. Have a minimum of 5 years' experience in the construction of marine structures with similar details

2. Responsible to direct this portion of the Work

3. Present at all times during execution of this portion of Work

4. Experienced with the type of materials being installed

5. Skilled in the required methods for installation

B. Provide skilled workers who are familiar with the Work involved and the techniques required for the proper execution of the Work.

1.04 REFERENCES

Specifications by ASTM International (ASTM), designated by basic reference in this Section. Use the most current edition at the time of bid unless otherwise indicated.

1.05 PRODUCT HANDLING

A. Store all materials above the ground, protect from moisture by canvas or plastic covers, and provide ventilation.

B. Handle all materials with care to avoid damage or distortion.

1.06 SUBMITTALS

Provide for each structural composite material.

A. Order list for pile caps, pile shims, and other materials required for a complete installation

B. Manufacturer's product data including material composition, flexural properties, shear strength, bearing strength, and ultraviolet testing

C. Manufacturer's data for handling and installation, including treatment at cuts and holes.

D. Manufacturer's warranty

PART 2 – PRODUCTS

2.01 ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMW-PE)

Provide new material with thickness, wear surface, and bearing area as shown on the Drawings. Use 2-1/2 percent UV-stabilized resin conforming to ASTM D 4020, having UV-stabilized dyes, and conforming to the following requirements.

Property	**Test Method**	**Acceptance Requirements**
Specific Gravity	ASTM D 792	0.93 g/cm^3 (min)
Ultimate Tensile Strength	ASTM D 638	6,300 psi (min)
Izod Impact, Double Notch	ASTM D 256A	23-29 ft-lbs/notch
Abrasion	Sand Slurry	16
Water Absorption	ASTM D 570	Nil
Coefficient of Friction	ASTM D 1894	0.20 (max)
Hardness	ASTM D 785	63-68
Thermal Expansion	ASTM D 648	9.0x10^{-5} in/in/°F
Color	Not Applicable	Black, unless otherwise directed by the Port

2.02 PLASTIC LUMBER

Use black plastic FIBERFORCE lumber produced by Bedford Technology (1-800-721-9037) or an equal approved by the Engineer at time of bid.

2.03 COMPOSITE PLASTIC SHIM MATERIALS

Provide shims cut from a 13-inch diameter composite plastic pile member (SeaPile by Trelleborg, 1-540-667-5191) where indicated on the Drawings.

2.04 HARDWARE

A. For bolts and miscellaneous hardware, use all new materials, conforming to product specifications and reference standards of Section 05 50 00 – Metal Fabrications, except as noted on the Drawings.

B. Provide a plain washer under all nut and bolt heads (except under heads of economy bolts) bearing on structural composite material.

C. Hot-dip galvanize all hardware, as specified above, conforming to the requirements of Section 05 50 00 – Metal Fabrications.

PART 3 –EXECUTION

3.01 PREPARATORY REVIEW

A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may commence and be performed in accordance with the Drawings and this Section.

B. Prior to ordering materials, field measure member sizes and lengths. Establish order lengths using the actual measured lengths plus any additional length to ensure a tight fit in the field, provided field cutting and treatment is permitted by the material manufacturer.

3.02 FABRICATION AND HANDLING

Follow manufacturer’s requirements for the care, handling, and field treatment of materials for service in a marine environment.

3.03 INSTALLATION

A. Perform all work in accordance with standard industry practices for marine construction and in a manner to achieve the tolerances specified.

B. Confine all handling of materials with pointed tools to the member ends. Use soft lines or straps for slings for handling, do not use steel cables.

C. Drill holes for bolts 1/16 inch larger than the bolt unless otherwise recommended by the manufacturer.

D. Provide plain washers under all bolt heads and nuts bearing on structural composite material unless otherwise indicated on the Drawings.

E. Treat cut ends and holes as required by the manufacturer for service in a marine environment. Allow each coat of any required treatment material to dry and fully cure before applying a subsequent coat or installation of the member.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 05 55 00 – Metal Fabrications

B. Section 31 62 00 – Steel Pipe Piles

1.02 DESCRIPTION OF WORK

The extent and location high performance coating work are indicated on the Drawings and in the Specifications. The Work includes furnishing all materials, labor, equipment, and accessories for preparing and providing the required finished protective coatings on the pipe piles as identified on the Drawings and in the Specifications.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. Specifications by ASTM International (ASTM), designated by basic reference in this Section

B. Society for Protective Coatings (SSPC), SSPC Painting Manual, Volume I, Fourth Edition, “Good Painting Practice.”

C. SSPC Painting Manual, Volume II, “Systems and Specifications.”

1.04 QUALITY ASSURANCE

A. Perform coating application with qualified and experienced personnel having demonstrated at least 5 years of experience in coating applications for marine structures and certified to level QP1 and QP3 by the Society for Protective Coatings.

B. Conform to all manufacturers’ specifications and recommendations for achieving best results with each product, application, and condition. If manufacturers’ specifications or recommendations differ from those in the specifications, report the discrepancy to the Port and obtain further direction.

C. The Port will inspect coating preparation, application, and/or touchup at its discretion. Provide access to the Port for these inspections at any time and at no additional cost to the Port.

D. Bring all conflicts to the Port's attention before ordering materials. In case of conflicts between references, the more stringent requirement, as determined by the Port, will control.

1.05 SUBMITTALS

A. Application firm and personnel qualifications and certifications. Include documentation that key personnel of the coating applicator have at least the minimum experience and certifications as described above and below.

1. Position or responsibility
2. Employer (if other than the contractor)
3. Name of facility owner
4. Mailing address and telephone number of facility owner
5. Name of contact reference in facility owner's organization
6. Location, size, and description of structure
7. Dates work was performed
8. Description of work performed on structure

B. A complete list of products and product descriptions proposed for use on the project. Provide manufacturers' product data and accessories, including specifications, physical characteristics, and performance data. Include the manufacturers' instructions and directions for application of the coating systems. Use the same manufacturer's products for all coats unless otherwise approved by the Port.

C. Samples of all paints and finishes proposed for use.

D. Specifications and procedures for use in performing field repairs and touch-ups to coating systems in conformance with the manufacturer's written recommendations.

E. Measurement reports of dry paint thickness on metal surfaces.

1.06 PRODUCT HANDLING

A. Deliver paint and associated materials in undamaged and unopened containers bearing manufacturers' labels, which indicate the contents and directions for use, storage, and handling. Store materials in a location where the ambient temperature is not outside the range recommended by the manufacturer.

B. Prevent fire. Open containers of flammable materials only as needed. Keep rubbing cloths and oily rags in tightly closed metal containers, or remove from the job site daily. Do not store benzene, gasoline, or distillates on the job site.

C. Do not damage the materials before, during, or after installation and prevent damage to the installed work and materials of other trades.

D. In the event of damage, immediately make all repairs and replacements as approved by the Port and at no additional cost to the Port.

PART 2 – PRODUCTS

2.01 COATING SYSTEM MANUFACTURERS

A. Except as otherwise specified, materials shall be the products of the following manufacturers and shall be suitable for steel corrosion protection in a marine environment:

1. Carboline Protective Coatings (206-243-6494)

2. AkzoNobel Marine and Protective Coatings (206-763-8003 and 206-762-6119)

3. Sherwin Williams Industrial and Marine Coatings (360-931-4645)

4. Tnemec Industrial Coatings (206-762-5755)

B. Products descriptions from AkzoNobel Marine and Protective Coatings are included in this Section. Proposed alternate products from other coating manufacturers will be considered. Bids shall be based on the products referenced in this Section.

C. Use a single coating manufacturer for the work.

D. Use products of the approved coating manufacturer for all other materials not specifically noted but required for the work, such as thinners.

2.02 COATING SYSTEMS

A. Prime coat: Devgrip 238 Epoxy by AkzoNobel Marine and Protective Coatings, applied to a dry film thickness of 6 to 8 mils.

B. Finish coat: Devgrip 238 Epoxy by AkzoNobel Marine and Protective Coatings, applied to a dry film thickness of 6 to 8 mils.

C. Stripe coat: Devgrip 238 Epoxy by AkzoNobel Marine and Protective Coatings, applied to a dry film thickness of 3 to 4 mils.

2.03 SUBSTITUTIONS

A. Approved substitutions shall be at no additional cost to the Port.

B. Manufacturer-specific coating systems are referenced in this Section. The manufacturer's identification numbers indicate the product type, quality, and performance required for the specific application.

C. Proposed alternates will be reviewed and evaluated, subject to the approval of the Port, based on equivalency to the coating system referenced as determined by the Port. Include substantiating technical data and documentation including performance history.

D. Submit in writing a request to the Port for review and approval prior to material procurement. Approval will not be granted unless it is determined that the performance of substitution, based on the technical data and performance history documentation submitted, is equal to that specified.

2.04 MIXING

Mix coating products in accordance with the manufacturers' written directions. Do not deviate in any manner except with written approval of the Port.

2.05 COLOR SCHEDULE

Use a black finish coat for all pipe piling.

PART 3 – EXECUTION

3.01 GENERAL

A. Apply paints and coatings in accordance with the manufacturer's recommendations for each application. Adhere to the manufacturer's provisions, directions, and procedures for the following.

1. Surface preparation
2. Ambient temperature and humidity monitoring
3. Mixing techniques

4. Minimum and maximum thickness per coat to achieve total thickness
5. Minimum time between coats

B. Use clean equipment and brushes. Spread materials evenly without runs, drips, sags, laps, brush marks, variations in color, texture, or sheen, and without “holidays.”

C. Vary color or sheens between coats and apply all coats to uniform thicknesses. Refinish any work determined defective or damaged, and repair all defective or damaged work at no additional cost to the Port. Leave finished surfaces clean, completely covered, and uniform in appearance.

3.02 PREPARATION FOR COATING SYSTEM – GUIDE PILES

A. Preliminary Metal Finishing Requirements

1. Round or chamfer sharp edges and grind smooth burrs, sheared edges, sawn edges, jagged edges, and surface defects to produce a smooth round edge with a radius of not less than 1/16-inch unless otherwise indicated.

2. Prepare welds and adjacent areas such that there is no undercutting or reverse ridges on weld beads, no weld spatter on or adjacent to welds or other areas to be coated, and no sharp peaks or ridges along weld beads. Grind embedded pieces of electrode or wire flush with adjacent surface of weld beads.

B. Before coating, hot-dip galvanize steel pipe piles in accordance with Section 05 55 00 – Metal Fabrications.

C. Follow the requirements of ASTM D 6386 for preparation of galvanized surfaces for coating and the requirements of this Section. Verify age of surface prior to preparation (newly galvanized, partially weathered galvanized, etc.) in accordance with ASTM D 6386 and follow applicable provisions of ASTM D 6386.

D. Solvent clean galvanized surfaces to be coated to remove contaminants using a biodegradable, water soluble, cleaner in conformance with SSPC-SP1.

E. Prepare galvanized surfaces to be coated with a light, sweeping abrasive sand blast to create a toothed surface profile in accordance with SSPC-SP7.

3.03 PREPARATION FOR COATING SYSTEM – GROUNDING SYSTEM SUPPORT PILES

A. Preliminary Metal Finishing Requirements

3. Round or chamfer sharp edges and grind smooth burrs, sheared edges, sawn edges, jagged edges, and surface defects to produce a smooth round edge with a radius of not less than 1/16-inch unless otherwise indicated.

4. Prepare welds and adjacent areas such that there is no undercutting or reverse ridges on weld beads, no weld spatter on or adjacent to welds or other areas to be coated, and no sharp peaks or ridges along weld beads. Grind embedded pieces of electrode or wire flush with adjacent surface of weld beads.

B. Before coating, remove visible oil, grease, and drawing and cutting compounds by solvent cleaning in accordance with SSPC SP-1.

C. After solvent cleaning, complete surface preparation by near-white blast cleaning in accordance with SSPC SP-10. Remove residual dust from blasted surface by blowing with dry, oil-free air, vacuuming, or sweeping. Provide surface profile of 1.5 to 2.5-mils thickness.

3.04 APPLICATION OF COATING SYSTEM

A. Apply coatings in accordance with the requirements of the SSPC Painting Manual, Volume I and the manufacturer's recommendations.

B. Apply stripe coat and prime coat to dry surfaces not more than 8 hours after near-white blast cleaning unless otherwise directed by the manufacturer.

C. Hand apply a stripe coat to welds, bolt holes, corners, edges, angles, stiffeners, crevices, and other difficult to coat surfaces (surfaces with limited or restricted accessibility for coating).

D. Apply a prime coat and finish coat to each guide pile as indicated on the Drawings.

E. Apply two prime coats and a finish coat to each grounding support system pile as indicated on the Drawings.

F. Thickness of prime coat and finish coat: Use ample undiluted materials; apply in uniform thickness over entire areas; do not exceed manufacturer's recommended spreading rate per gallon.

G. Tint prime coat and strip coat as necessary to obtain uniform finish coats.

3.05 TOUCHUP

Immediately restore coatings damaged due to field welding or other activities to original thickness, after thorough cleaning and necessary surface preparation. Touch up with coating material that is compatible with the shop-applied coating and recommended in writing by the coating manufacturer. Follow coating manufacturer's recommendations for surface preparation, field coating, number of coats, and curing.

3.06 INSPECTION

Perform measurements of dry paint thickness on all metal surfaces by means of magnetic gauges as described in SSPC-PA2. Provide copies of the measurement reports to the Port.

END OF SECTION

SECTION 26 0126

ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.02 APPLICABLE PUBLICATIONS

A. All inspections and tests shall be in accordance with the following applicable standards and codes. These publications form a part of this specification to the extent referenced.

1. American Society for Testing and Materials (ASTM):

   D877 - Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.

2. Insulated Cable Engineers Association (ICEA):

   S-68-516 - Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. National Electrical Manufacturers Association (NEMA):

   WC8 - Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. (ICEA S-68-516)

4. Institute of Electrical and Electronic Engineers (IEEE):

   81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

   400 - Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field.

5. National Electrical Code – NEC
6. American National Standards Institute - ANSI
7. National Fire Protection Association - NFPA
8. Occupational Safety and Health - OSHA 29CFR Part 1910.269
9. International Electrical Testing Association – NETA
10. Nationally Recognized Testing Laboratory Approved - NRTL
11. State and Local Codes and Ordinances

1.03 SAFETY

A. Adhere to safety procedures as required by the following:

1. Occupational Safety and Health Act.
2. Accident Prevention Manual for Industrial Operations, National Safety Council.
3. ANSI/NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
4. American National Standards for Personnel Protection: Lockout/Tagout.
5. Applicable state and local safety operating procedures.

B. Perform all tests with apparatus de-energized, except where specifically required.

C. Designate a Project Safety Representative to supervise operations with respect to safety.

1.04 WORK INCLUDED:

A. Perform tests of the electrical system to assure code compliance and proper system operation according to the intent of the contract documents.

B. Applicable Codes, Standards & References for Tests:

All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

1. National Electrical Code - NEC
2. National Electrical Manufacturer's Association - NEMA
3. American Society for Testing and Materials - ASTM
4. Institute of Electrical and Electronic Planss - IEEE
5. National Electrical Testing Association - NETA
6. American National Standards Institute - ANSI
7. Washington State Administrative Code - WAC
8. Insulated Cable Planss Associate - ICEA
9. Association of Edison Illuminating Companies - AEIC

1.05 CIRCUIT TESTS:

A. The Contractor shall perform routine insulation resistance, continuity and grounding tests for all distribution and utilization equipment prior to their connection and energization. A standard megger-type instrument shall be used to demonstrate insulation values are 200 megohms, ground system is continuous and the neutral system is isolated from the grounding system except at the systems' single ground point.

B. System defects, indicated by the circuit tests, shall be corrected. Tests shall be repeated until satisfactory results are obtained.

1.06 GROUNDING TEST:

A. Measure the ohmic value of the Electrical Service Entrance "System Ground" with reference to "Earth Ground" using multiple terminal, fall of potential methods and suitable test instruments.

B. Maximum resistance to ground shall be less than 10 ohms. Notify the Port of Grays Harbor if this resistance value is not obtained for the initially installed system.

1.07 PHASE BALANCE TESTS:

A. Verify the balance of the electrical system's phase currents. Re-assign load connections necessary to obtain a balance acceptable to the Port of Grays Harbor.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Utilize test equipment in good mechanical and electrical condition with shape and frequency output waveforms appropriate for the test and the tested equipment.

1. Accuracy shall be appropriate for the test being performed, but not in excess of 2% of the scale being used.

B. Field test meters used to check installed power system instrument calibration must have an accuracy higher than the instrument being checked.

2.02 TEST INSTRUMENTS AND CALIBRATION

A. The Testing Firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy as dictated by the National Institute of Standards and Technology (NIST).

1. Instruments calibration schedule:
   a) Field instruments: Analog, 6 months maximum; Digital, 12 months maximum
   b) Laboratory instruments - 12 months.
   c) Leased specialty equipment - 12 months (where lessor guarantees accuracy).
2. Provide visible dated calibration labels on all test equipment.

3. Maintain up-to-date instrument calibration instructions and procedures for each test instrument.

B. Provide all testing equipment required including, but not limited to, the following:

1. Battery-powered portable telephone sets
2. Multimeter (Volts-Ohms-Millimeter) rated 20k ohms per volt or higher.
3. Three-phase rotation meter, 60-Hz.
4. Commercial model three-point earth ground test set that reads directly in ohms.
5. Miscellaneous cable, test leads, jumpers, test lights, buzzers, bells, switches, plugs, receptacles, and other test equipment as required.
6. Insulation Tester (Megger): 2,000 Megohms.
7. Clamp-on Ammeter.
8. Circuit Breaker Current Injections Test Set.

2.03 TEST REPORT

A. Include the following:

1. Summary of Project.
2. Description of equipment tested.
3. Description of test.
4. Test results.
5. Analysis and recommendations.
6. Appendix, including appropriate test forms.
7. List of test equipment used and calibration date.

B. Furnish 5 copies of the completed report to the Engineer no later than thirty days after substantial completion of the project.

2.04 MATERIALS AND INSTRUMENTATION:

A. Contractor and/or testing agency shall supply all apparatus and materials required for indicated tests.

B. Contractor shall include all costs associated with testing in bid proposal.

PART 3 - EXECUTION

3.01 TESTING

A. General requirements: Test all wire, cable, and electrical equipment installed and connected by the Contractor to assure proper installation, setting, connection, and function as indicated or to conform to Contract Documents and manufacturer's instructions.

B. After the installation has been completed, the Contractor shall conduct an operating test demonstrating all equipment and devices operate in accordance with the requirements of the plans and specifications.

1. Perform tests recommended by the equipment manufacturer.
2. Perform additional tests issued by the Port of Grays Harbor which are required due to field conditions.
3. Be responsible for all damage to equipment or material due to improper test procedures or test apparatus handling.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

A. Bidding documents including Division 1 General Conditions, Supplementary General Conditions, Published Addenda and related work in other Divisions form an integral part of these Specifications.

1.02 DEFINITIONS:

A. The term "provide" shall mean furnish, install and connect equipment and materials complete in operating condition.

B. The term "approved" as used herein shall mean the written approval of the Engineer.

C. NEC means National Electrical Code.

D. The term "code" as used herein shall mean all applicable National, State and local codes.

1.03 WORK INCLUDED:

A. The Electrical work consists of furnishing, installing, testing and placing in satisfactory operation all equipment, materials, devices and appurtenances, necessary to provide a complete electrical system according to the intent of the Drawings and Specifications. In general this includes all labor, materials, equipment, tools, etc. to complete the electrical work.

B. Coordination with Grays Harbor PUD for installation of new service equipment.

1.04 INTENT OF DRAWINGS:

A. The Electrical Drawings are intended to serve as working Drawings for general layout. Equipment, panels, disconnects and raceway locations are partially diagrammatic and do not necessarily indicate actual routings or all appurtenances required for a complete installation.

B. Minor changes in the locations of raceways and the like, from those shown on the Plans, shall be made without extra charge if so directed before installation.

C. Contractor is required to take all working dimensions from field measurements. Do not scale electrical Drawings.

D. Trenching, backfill, compaction, hand digging and repairs are required as part of this project.

1.05 MANUFACTURERS' RECOMMENDATIONS:

A. Make all installations in strict accordance with manufacturers' published recommendations and details. All equipment and materials recommended by them shall be considered as part of this contract.

1.06 SUPERVISION AND COORDINATION:

A. Coordinate work with Port of Grays Harbor to ensure compliance with their specific requirements.

B. Contact Washington State Labor & Industries, obtain and pay for electrical permit before starting work.

C. Contact Grays Harbor PUD (Jeff Perrin – (360) 532-4220) and coordinate new electrical service to the site.

D. Contractor shall have a responsible person in charge at the site any time work is in progress or when necessary for coordination with other trades.

1.07 CODES AND REGULATIONS:

A. All work shall conform to current applicable National, State and local Codes; these shall be regarded as the minimum standard of quality for material and workmanship. Contractor shall provide all Labor and Material that may be required for compliance with Code Requirements or Code Interpretations, although not specifically detailed on the Drawings or in the Specifications. Contractor shall become familiar with all the following codes prior to bidding.

ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
WAC	Washington State Administrative Code
NESC	National Electrical Safety Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
ICEA	Insulated Cable ENGINEERs Associations
CBM	Certified Ballast Manufacturers
ETL	Electrical Testing Laboratories

B. Nothing in these Drawings and Specifications shall be construed as permitting work not conforming with governing codes.

C. The Contractor shall not be relieved from complying with any requirements of these contract documents which may exceed, but not conflict with requirements of the governing codes.

1.08 PERMITS AND FEES:

A. Obtain and pay all fees for licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work and provide inspectors with all necessary assistance.

1.09 WORKMANSHIP:

A. All work shall be done by competent craftsmen skilled in the specific work to be done. Equipment shall be installed in a neat and workmanlike manner following the best practice of the trade.

1.10 AS-BUILT RECORD DRAWINGS:

A. See Specification Section 01 07 00.

1.11 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O & M) MANUALS:

A. See Specification Section 01 07 00.

1.12 FINAL INSPECTION:

A. The contractor's superintendent or principal shall accompany the Engineer on the Final Inspection, and on any necessary Post-Final Inspections, to confirm all work has been satisfactorily completed.

B. Defects and deficiencies found during this Final Inspection shall be corrected within 5 days of Contractor's receipt of the Engineer final punch list.

C. All punch list items are to be complete prior to the final completion date.

D. Record Drawings are required prior to final inspection.

1.13 FINAL ACCEPTANCE:

A. These items are a prerequisite for final acceptance and payment:

1. Three (3) Electrical Equipment Operation and Maintenance Manuals, which will also include the items listed below.
2. Certificates of Final Inspection
   a. Electrical Inspector
3. Warranties for equipment
4. As-Built record Drawings.

1.14 WARRANTY:

A. The Contractor shall provide written warranty to repair or replace (without additional cost to the Port of Grays Harbor) any defective materials or workmanship which become evident within a period of one (1) year after final acceptance or for such longer period as elsewhere specified. All warranty work shall be to the satisfaction of the Port of Grays Harbor.

B. Any material warranteed by a specific manufacturer for a period in excess of one year shall be specifically noted on the written warranty.

PART 2 - PRODUCTS

2.01 GENERAL:

A. All materials shall be new, free from defects, of the quality specified herein and on the Drawings. Materials shall be designed to ensure satisfactory operation and rated life in the prevailing environmental conditions where they are being installed. They shall be listed by Underwriter's Laboratories or a Washington Administration Code (WAC) recognized testing laboratory for use under these conditions.

B. Each type of material shall be of the same make and quality throughout the job. The materials furnished shall be the latest standard design products of manufacturers regularly engaged in their production.

2.02 TECHNICAL DATA:

A. Technical information contained herein relies entirely on tests and ratings provided by manufacturers who are solely responsible for their accuracy. The Port of Grays Harbor using this information in no way implies they have tested or otherwise verified the results of published manufacturer's information.

2.03 AS SPECIFIED EQUIPMENT:

A. This specification generally lists only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required.

B. In addition, the listed product is the basis of the design regarding physical size, electrical power requirements and performance. The product so identified is designated "as specified."

2.04 COMPLETE SYSTEMS:

A. All systems specified herein and shown on the Drawings shall be complete and operational in every detail. Mention of certain materials in bidding documents shall not be construed as releasing the Contractor from furnishing additional materials required by the manufacturer, installation methods, codes and performing all labor required to provide a complete and operable system.

2.05 SUBMITTALS:

A. Submittal items: Submittals shall include, but not be limited to the following items:

- Panels
- Raceways
- Wires (600V)
- Grounding Equipment
- Name Plates
- Light Fixtures
- Items Requested by the Port of Grays Harbor

PART 3 - EXECUTION

3.01 PROTECTION OF WORK:

A. Protect all work, wire, materials and equipment installed under this Division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.

B. Equipment shall be kept covered or enclosed to exclude moisture, dust, dirt, cement, or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish in a manner acceptable to the Engineer if damaged.

C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Pull a properly sized mandrel through each conduit prior to installation of wire or pull string for empty conduits. Raceways shall be clean and dry before installation of wire and at the time of acceptance.

D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled-in until raceways are complete, all bushings are installed and raceway terminations are completed nor pulled into conduit embedded in concrete until after the concrete is placed and forms are removed.

3.02 CUTTING AND PATCHING:

A. Obtain permission from the Engineer prior to cutting. Cut carefully and only the minimum amount necessary.

B. All construction materials damaged or cut into during installation must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 PAINTING:

A. Equipment scratched or marred in shipment or installation shall be refinished to the satisfaction of the Engineer.

3.04 LABELING:

A. Clearly and properly label the complete electrical system, as specified herein, to indicate the loads served or the function of each item of equipment connected under this contract.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Provide all wire and terminations for a complete installation

PART 2 - PRODUCTS

2.01 PACKAGING:

A. Conductors shall be delivered to the job site in approved original cartons, or on reels as recommended by the manufacturer, and shall bear the Underwriter's Label. Reels shall be provided with suitable protection to prevent fork-lift damage to conductors during shipment or storage prior to use.

2.02 CONDUCTORS - 600 VOLTS:

A. Stranded Copper, insulated for 90 degree centrigrade and 600 volts.

B. Insulation type XHHW-2. Insulation requirements may vary per the NEC where necessary to suit more stringent installation conditions.

2.03 CONNECTORS - 600 VOLTS:

A. Branch circuit conductor splices: Not Allowed

2.04 INSULATING MATERIALS:

A. Insulating tape or heat shrink tubing shall have the equivalent rating of the applicable conductor insulation (Scotch 3M, RAYCHEM or equal).

2.05 PLASTIC CABLE TIES:

A. Nylon, or equivalent, locking type (T&B or equal).

PART 3 - EXECUTION

3.01 GENERAL:

A. Install all wiring in raceway.

3.02 CONDUCTOR TYPES, REFERENCED ON PLAN:

A. Conductors shall be stranded copper.

3.03 CONDUCTOR COLORING CODE:

Conductor color coding shall be as follows:

A. 240/120 volt system

A Phase - Black

B Phase - Red

Neutral – White

Grounding - Green

B. Conductors shall have colored insulation except wires larger than #8 may be black with colored tape identification at all terminations and splices.

C. Additional colors may be used where such colors will help in identifying wires and different systems.

3.04 CONDUCTOR INSTALLATION:

A. Raceways shall be complete, clean and free of burrs before pulling conductors.

B. U.L. approved pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.

C. Contractor shall obtain the manufacturer's published recommendations for the handling, pulling and terminating of the cable. Contractor shall perform work in accord with manufacturer's recommendations.

D. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radius of the cable and compounds. No mechanical pulling means shall be used for wires No. 8 AWG and smaller. Cables shall be pulled by the conductor, not by the insulation or shielding.

3.05 MOISTURE PROTECTION:

A. Cable ends shall be protected at all times from moisture. Provide approved heat-shrink end caps or equivalent for all un-terminated cable ends.

3.06 TERMINATIONS - COPPER CONDUCTORS 600 VOLTS:

A. All screw and bolt type connectors shall be made up tight and retightened after an eight-hour period. Tighten all bolted connections with a ratcheting type torque wrench per manufacturer's standards.

B. All tool applied crimped connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

SECTION 26 0533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Provide all raceways for a complete electrical system. Include all fittings, hangers and appurtenances required for a complete installation.

PART 2 - PRODUCTS

2.01 CONDUITS:

A. Non-metallic, polyvinyl chloride (PVC) schedule 40 (below grade).

B. Galvanized Rigid Steel (GRS) above grade installations.

C. Liquid tight sunlight resistant Flexible PVC Conduit.

2.02 FITTINGS:

A. Liquid tight Flexible Conduit: "Super Liquid-Tight".

B. PVC Schedule 40/80 fittings shall be solvent welded type.

PART 3 - EXECUTION

3.01 GENERAL:

A. Install above grade raceways surface mounted on custom stainless steel mounting bracket(s).

B. Cut conduit ends square, ream smooth and extend maximum distance into all couplings and connectors.

C. Provide and install manufactured end caps on all conduit ends during construction to prevent the entrance of water or dirt. Tape, as a cover, is unacceptable.

D. Pull a properly sized mandrel through each conduit prior to installation of conductors or pull-lines to remove any materials trapped within the conduit run.

E. The conduit layout shall be carefully planned by the contractor to ensure neat and workmanlike installation.

F. Provide bell ends for all conduits entering and leaving manholes, vaults and pull boxes.

G. Any work showing inadequate planning may be ordered removed by the Engineer and shall be replaced in a neat and proper manner at no additional cost to the Port of Grays Harbor.

3.02 CONDUIT SIZING:

A. Conduits shall be sized per code for conductors with type XHHW-2 insulation. Conduit size shall not be reduced if large size is specified on the drawing. Minimum conduit size shall be 3/4" trade diameter.

3.03 LIQUID TIGHT FLEXIBLE PVC CONDUIT:

A. Provide liquid tight flexible PVC conduit connection for land to ramp and ramp to float transitions. Securely attach to existing stainless steel conduit support identified to be reused.

3.05 PVC CONDUIT SCHEDULE 40:

A. PVC conduit Schedule 40 may be used underground/surface. Field bends, when necessary, shall be formed with factory recommended bending equipment. Offsets and bends shall not exceed 22 degrees without engineers field review and approval. .

3.06 CONTINUITY OF CONDUIT SYSTEM:

A. Conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electric continuity.

3.07 PULL-LINES:

A. Provide 150 pound plastic pull-lines, with numbered distance marks at one-foot increments in all conduit-only systems and spare conduits to facilitate future conductor installation. Provide labels on source and end point of all pull lines

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations.

B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.02 REFERENCES

A. ANSI/IEEE C2 - National Electrical Safety Code.

B. NFPA 70 (National Fire Protection Association) – National Electrical Code.

1.03 QUALITY ASSURANCE

A. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

B. Comply with ANSI C2.

1.04 SUBMITTALS

A. Product Data for each type of product specified.

PART 2 - PRODUCTS

2.01 LABEL TYPES

A. Manufacturer's standard products with colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install identification labels according to manufacturer's written instructions.

B. Install labels where indicated and as required by the Authority Having Jurisdiction. Locate for optimum viewing and without interference with the operation and maintenance of equipment.

C. Conductor Identification:

1. Multiple Circuits in the Same Enclosure: Identify each circuit with plastic ID tag indicating source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.

D. Warning, Caution, and Instruction Signs:

1. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all panelboard equipment complete Nema 4X, dead front type, door in door construction and shall bear the U.L. label. Nema 4X panels with interior equipment mounting hardware protruding through exterior can are not acceptable. Load centers will not be acceptable.

B. All panels provided for service entrance locations as defined by the NEC shall be provided with a UL label, “Suitable for Use as Service Entrance Equipment” (SUSE).

1.02 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture. Include front view, dimensions, device sizes and layout, list of nameplates and all other information required to demonstrate conformance with contract documents.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Siemens

B. General Electric

C. Square D

D. Cutler Hammer

2.02 PANELBOARD DESCRIPTION

A. Voltage, arrangement, and capacity of bus and overcurrent protective devices shall be as shown on the drawings. Bus shall extend behind all spaces ready for future overcurrent protective devices.

B. Buss bars shall be plated copper with ampere density not-to-exceed 1200/1000 amperes per square inch.

C. Bussing shall be 1 phase, 3 wire, 100 percent neutral, braced to match the interrupting rating of the breakers.

D. Provide multiple lugs where parallel or "feed-through" connections are shown on drawings.

E. Provide separate neutral and ground buses at the bottom of each panelboard.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. The AIC rating of the panel and circuit breakers shall be as specified on the drawings.

B. Mount breakers in all panelboards so breaker handles operate in a horizontal plane. Provide common trip on all multiple pole breakers.

C. All circuit breakers shall be bolt-in type.

D. Circuit Breakers rated 15A through 30A shall be U.L. rated for 60/75 degree centigrade wire. Breakers 35A and larger shall be rated for 75 degree centigrade. Provide handle ties for all single pole breakers utilizing a shared neutral wire.

E. Circuit breakers intended for switching 120 volt loads shall be switching duty rated (SWD).

F. Provide "Spare" overcurrent devices, where noted on the drawings, complete and ready for future circuit connections.

G. Provide "Space" for future overcurrent devices, where noted on the drawings. Space shall include all bussing and device mounting hardware. Provide approved coverplates or overcurrent devices in all spaces. Open spaces in the panel are not permitted.

2.04 ENCLOSURE GENERAL CONSTRUCTION

A. Provide cabinets of sufficient dimensions to allow future expansion and addition of overcurrent devices within the panelboards.

B. All electrical distribution equipment locks shall be keyed identically.

C. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Secure panelboards in place with top of cabinet at 6'-0", above finished grade. Top of cabinet and trim shall be level; trim and door shall fit neatly without gaps, openings or distortion.

B. Top edges of adjacent panels shall be even.

3.02 CIRCUIT INDEX

A. Each panelboard shall be provided with a typewritten index listing each circuit in the panel by number, with its proper designation. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Mount index with a transparent protective cover inside the cabinet door.

3.03 PANELBOARD NAMEPLATE:

A. Provide phenolic engraved nameplate for each panelboard. Adhesive only, do not screw to panel face.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in:

A. Section 02 32 00 – Geotechnical Investigations

B. Section 02 41 00 – Demolition

1.02 DESCRIPTION OF WORK

The extent and location of the "Marine Earthwork" are indicated on the Drawings. The work includes excavation, backfill, and compaction of areas associated with the boat ramp and abutment construction in conformance with these Specifications and as indicated on the Drawings.

1.03 REFERENCES

A. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).

B. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, 2014 edition, by Washington State Department of Transportation (WSDOT Standard Specifications).

1.04 QUALITY ASSURANCE

A. On-Site Testing and Inspection: The Port will provide and pay for on-site testing and inspection services. Sampling and testing for compliance with the contract provisions. Assist the Port in obtaining samples at no cost to the Port. Tests conducted for the sole benefit of the Contractor shall be at the Contractor's expense.

B. Compaction Control Tests: The Port will provide and pay for laboratory and on-site field compaction control tests in accordance with the applicable provisions of these Specifications.

1. The compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D 1557, Methods B, C or D as applicable, but shall be no less than

95 percent of dry density for Landside Backfill, Base Course, Top Course, and Ballast Material.

2. Perform field tests to determine in-place compliance with required densities as specified, in accordance with ASTM D 1556, D 2167, or D 2922.

C. Comply with the applicable provisions of all pertinent codes and regulations. References made herein to materials and execution of work refer to designations published in the WSDOT Standard Specifications.

1.05 SITE CONDITIONS

A. At the start of demolition of the existing concrete boat launch ramp, meet with the Port's geotechnical engineer on site to assess the condition of the existing sub-base for the ramp. The Port's geotechnical engineer will assess and make determinations about the anticipated soil and foundation conditions after the contractor has started demolition of the ramp.

B. Anticipate encountering groundwater at or near the existing ground surface at much of the project site. The groundwater elevation varies depending upon proximity to the shoreline, soil conditions, tidal conditions, and weather.

C. Due to the relatively shallow depth of typical earthwork activities, and the design depth of the sub-base, regulated materials are not expected for those and similar-depth activities.

D. Verify the location of existing utilities at the site, and use an independent private locate company to assist. Protect those utilities which are to remain from damage and maintain operation. Damage to utilities which are to remain shall be repaired by the Contractor at no cost to the Port.

1.06 SUBMITTALS

A. Before bringing to the site, perform, pay for, and submit test reports for all imported materials in accordance with the off-site borrow source characterization and characterization testing, reporting, and certification requirements specified herein.

B. Before bringing to the site, perform, pay for, and submit test reports for all imported materials to determine the achievable in-place densities of off-site borrow source materials, in accordance with the requirements for compaction control tests above.

PART 2 – PRODUCTS

2.01 CHARACTERIZATION TESTING, REPORTING, AND CERTIFICATION

A. Materials and products shall be of the quality, size, shape, and gradation as specified in the contract documents, or shall be approved by the Port as equal.

B. Provide and pay for source characterization, testing, reporting, and certification for all off-site borrow materials as described below. Provide documentation for the Port's approval demonstrating that all imported materials from a borrow pit meet the contract requirements and certify that the materials are free of regulated materials.

2.02 OFF-SITE BORROW SOURCE CHARACTERIZATION

A. Off-site borrow source characterization, testing, reporting, and certification shall be performed on all imported materials as specified above to assure that they meet the contract document requirements, are natural, native, virgin materials, free of debris, other deleterious substances, regulated materials, and recycled materials.

B. Submit a characterization report and certification, for approval by the Port, for all imported material prior to placement on-site.

1. Base the characterization on multiple samples, include source identification, analyses of a material source sample, and a source inspection report.

2. Once approved and imported to the site, perform an on-site inspection of the material to verify that it is the material sampled, characterized, and approved.

3. Provide source identification documentation of the origin of imported materials and maps identifying specific location(s) of material source(s). Submit the physical and chemical characterization reports provided by the material supplier.

4. Inspect all material sources for visual compliance with the contract documents. Visually inspect import material upon delivery to the site. Materials shall be inspected for presence of foreign, recycled, or reprocessed material. Report anomalies to the Port immediately.

5. Provide the Port a minimum one week notice of such inspections. The Port may accompany the Contractor to witness source inspections. Witnessing an inspection shall in no way be construed as a substitute for compliance with the specifications and in no way shall be construed as approval of any particular source of material.

6. The Port may perform an independent inspection and the source material may be re-tested. Material may be rejected as a result of substandard test results from the re-test.

C. The characterization testing, reporting, and certification requirements described above may be waived if it's demonstrated, as determined by the Port, that the material is from a known source, of natural origin, is supplied by a commercial material supplier, and if free of regulated materials at the concentrations as defined above. The information used to demonstrate compliance must be recent, contain sufficient quality assurance/quality control data with results, and be from a laboratory recognized and acceptable to the Port.

D. Any imported materials determined by the Port to be substandard will be rejected. Remove all rejected material and rejected material stockpiles from the site at no cost to the Port.

2.03 ON-SITE BACKFILL SOURCE CHARACTERIZATION

A. Excavated in-situ soils generated during site construction activities may be used or reused as backfill material, if approved by the Port. It is to be assumed all excavated in-situ material will be found acceptable for reuse.

1. Submit a written request for use of on-site borrow materials at least two weeks prior to on-site placement. Identify the source of the excavated material, proposed on-site use, and quantity of material to be used.

2. Provide samples of the material for physical and/or chemical characterization as requested by the Port. Do not reuse the material at the site until approved by the Port.

3. Characterization and characterization testing of excavated materials proposed for reuse may be performed by the Port, to assure that backfill materials are free of regulated materials and the material meets the requirements of the contract documents.

B. The Port may reject any materials that have been determined to be substandard or contain regulated materials. One or more of the tests listed in these Specifications may be required prior to acceptance.

2.04 QUARRY SPALL MATERIAL

Meet the requirements of WSDOT Standard Specifications, Section 9-13.6.

2.05 PERMEABLE BALLAST MATERIAL

Meet the requirements of WSDOT Standard Specifications, Section 9-03.9(2).

2.06 GEOTEXTILE FILTER FABRIC

Meet the requirements of WSDOT Standard Specifications, Section 9-33.2(1), Table 3, Geotextile for Separation or Soil Stabilization.

PART 3 – EXECUTION

3.01 GENERAL

A. Excavate and backfill as specified herein, within the tolerances established in the contract documents, and conform to recognized industry standards, whichever are more stringent.

B. Excavation: Homogeneous or mixtures of naturally occurring earth, fill, sand, gravel, stones, clays, or loam, moved to facilitate the construction of structures, utilities, trenches, and associated work.

C. Move excavated material with the use of mechanical equipment, such as shovels, loaders, bulldozers, etc. Do not use drilling, blasting, or drilling and line breaking. Do not move excavated material by sluicing method.

D. Where possible, excavation shall be removed in horizontal layers, and in such a way that the resulting stockpiles are a blend of the naturally occurring materials.

E. Backfill by placing material in horizontal layers upon earth which has been prepared or otherwise approved by the Port.

F. Construct in compacted layers of uniform thickness. Carry the layers up full width from the bottom. Compact with modern, efficient compacting units, or as directed by the Port. The compacting units may be of any type, provided they are capable of compacting each lift of the material to

the specified density. The Port may order the use of any particular compacting unit discontinued if it is not capable of compacting the material to the required density within a reasonable time, or if the equipment may damage underlying or adjacent soils or structures.

G. Construct backfill areas in in accordance with WSDOT Standard Specifications Section 2-03.3(14)C, Do not exceed 8 inches in loose thickness for each horizontal layer. Compact each layer to 95% of the maximum density as determined by compaction control tests described herein. Use small mechanical or vibratory compactor units to compact the layers adjacent to structures that are inaccessible to other compaction equipment.

D. Protect excavated material, stockpiled for reuse as backfill, from contamination by other materials and by covering with sheeting. Replace any material not properly protected which becomes unsuitable or contaminated at no additional cost to the Port.

E. Employ separate stockpiles for material to be reused as backfill and unsuitable material. At end of project, haul away any material remaining in temporary “material acceptable for reuse” stockpiles, following testing of material by the Port. Haul excess material off-site to a Port approved disposal facility that is appropriate for the material being disposed. Disposal of material off-site prior to end of project, when there is still potential the material may be needed for backfill, shall first be approved by the Port.

3.02 EXCAVATION

A. Excavate as necessary for the ramp and abutment to the lines and grades indicated on the Drawings.

B. Excavation below the designed depth, except as directed by the Port, shall be backfilled with controlled density fill or select backfill material and compacted, at the Contractor’s expense and as directed by the Port.

C. Brace and shore sides of excavations. Comply with all federal, state, and local regulations regarding shoring, bracing, and other protection requirements.

D. Keep water out of excavated pits and trenches by pumping or other means of dewatering. Keep the water level below the bottom of concrete pours before, during, and for a minimum of seven days thereafter.

3.03 UNSUITABLE EXCAVATION AND DISPOSAL

A. Unsuitable excavation consists of unstable materials, such as peat, muck, water-impregnated clays, swampy or other undesirable materials, including buried logs, stumps, or trash. Remove unsuitable excavation materials shall be removed to the depth designated by the Port.

1. Replace excavated unsuitable material as directed by the Port.

2. Unsuitable materials, excess material and any excavated material not approved by the Port for use as backfill will be tested by the Port and then transported off-site by the Contractor to a proper disposal facility.

3.04 FILLING AND BACKFILLING

A. Place materials as indicated on the Drawings, over compacted subgrade. If subgrade is soft and cannot be adequately compacted, contact the Port for direction.

B. Remove water from excavated areas, by pumping or other means, before placing any backfill material.

C. Compact subgrade, as specified below, before placing any fill or aggregate material.

D. Do not place and compact any backfill material against recently poured concrete until the concrete has attained a minimum of 85 percent of the compressive strength and has set and cured a minimum of 7 days.

E. Place backfill to the lines and grades indicated on the Drawings.

3.05 COMPACTION

A. Subgrade Preparation:

1. Grade subgrade within a tolerance of 0.05 foot plus or minus in 10 feet, ready for base course.

2. Immediately prior to placement of backfill materials, clean the entire width and length of the area to be backfilled. Remove all debris and organics and dispose of as directed by the Port.

3. Drain all depressions or ruts that contain water.

4. Shape the entire subgrade to a smooth uniform surface, true to line, grade, and cross section in accordance with the drawings and as directed by the Port.

5. Compact the subgrade material to a depth of 6 inches to 95 percent of the material's maximum dry density as determined by ASTM D 1557. If soft or spongy material underlying the subgrade precludes satisfactory compaction, loosen, aerate, or excavate, replace and compact to the required density as directed by the Port.

B. Compact with approved equipment suited to the materials and the area being compacted. Moisten or aerate material as necessary to provide the moisture content that is in conformance with this Section and will readily facilitate obtaining the specified compaction with the equipment used.

C. Place each lift of material placed shall be uniformly compacted to the density indicated for the specific material and use set forth in these specifications. The percent of density required is in relation to the maximum density obtainable at optimum moisture content as determined by the Compaction Control Tests.

3.06 EXCESS MATERIAL DISPOSAL

Dispose of all excess soils and materials that the Port determines to be Excess Material. Dispose of soils and materials location(s) permitted to receive the type of excess soils and materials to be disposed. Prior to removing from the site, coordinate with the Port for testing of the material. The Port will test the material prior to disposal.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 05 50 00 – Metal Fabrications

B. Section 09 96 00 – High Performance Coatings

1.02 DESCRIPTION OF WORK

A. The extent and location of the pile work are indicated on the Drawings. The Work includes the requirements for furnishing, transporting, handling, and installing steel pipe piling. It also includes the requirements for pile cut-offs, pile connections, and welding on additional pipe to extend piles if required.

B. Driven pile work also includes meeting the requirements for pile tolerances, cut-offs, inspections, and installation record keeping.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Petroleum Institute (API), Specification for Line Pipe (API 5L)

B. Specifications by ASTM International (ASTM), designated by basic reference in this Section

C. American Welding Society (AWS) D1.1, Structural Welding Code – Steel

D. American Wood Preservers Association (AWPA) Specifications and Standards, designated by basic reference in this Section

1.04 QUALITY ASSURANCE

A. Provide at least one qualified person with a minimum of 5 years' experience with marine conditions, all piling types, piling lengths, and installation methods to be used on the project, to supervise and direct all work performed under this Section.

B. Provide at least one qualified person with a minimum of 5 years of experience in marine piling inspection to observe all steps of the pile installation operation and record detailed installation records of each pile installed, from the time the pile is picked until installation is complete.

C. Do not permanently mark piles where visible above the extreme low tide level.

D. Install piling in an accurate and undamaged manner and make pile inspections as necessary to ensure that this is done.

E. Inspect all piles after installation. Perform a visual inspection from mudline to top of each pile. Verbally report the pile inspection results to the Port within 48 hours of installation of each pile. Immediately report any damage to pile or pile coating to the Port. Furnish a written report to the Port stating the scope and results of the pile inspection. Furnish report to the Port prior to erection of grounding structure and installation of concrete floats.

F. The Port, at its discretion, will inspect the above-water and underwater portions of piling. Make available the site, or portions thereof, to meet the Port's inspection schedule, and at no additional cost to the Port. A report will be prepared by the Port and be made available for review. Any discrepancy between the Port's and the Contractor's inspection reports shall be resolved by a joint inspection. Inspection by the Port will be performed at no cost to the Contractor.

1.05 SUBMITTALS

A. Mill certificates for steel piling.

B. Manufacturer's certificate of compliance for steel piling.

C. Joint welding procedures for pipe pile splices if needed.

D. Order and coating lengths for steel piling.

E. Connection details to pile caps

F. List of proposed equipment and procedures to be used in pile installation, including crane capacities, lead lengths, lead types, hammer types, rated energies, cushion materials, helmet materials, modulus of elasticity, etc.

G. Detailed pile plan and installation schedule showing the location of each pile to be installed. Include dimensions and field-verified measurements relative to concrete abutment.

H. Details of pile installation equipment, templates, and falsework to be used to place piling and describe means and methods to achieve plumbness and prescribed alignment (plan locations and elevations).

I. Daily pile-installation record: Keep a complete and accurately written pile installation record for each pile including date, time, and weather. Indicate the pile location, elevation, deviations from design location, pile cross section dimensions, original length, coated length, ground elevation, tip elevation, cutoff elevation, and penetration. Also include vibratory and impact hammer data including rate of operation, make, and size of hammer, and unusual pile behavior or circumstances experienced during pile installation such as stopping and restarting, weaving, obstructions, or unanticipated interruptions. Include a continuous record of advancement per minute during vibratory installation such that the rate of advancement and delivered energy to the pile can be accurately determined. Submit each record to the Port within 24 hours of installing the pile.

1.06 SITE CONDITIONS

A. Existing Facilities and Pile Installation Restrictions:

1. Install piles at the designated locations and be prepared to encounter subsurface obstructions.

2. The 28th Street Boat Launch is adjacent to an active shipping lane. Do not interrupt the operation of shipping in the lane at any time without obtaining written prior approval from the Port.

3. Install piles between the hours of 8 a.m. and 6 p.m., unless otherwise stipulated in the project permits. Install piles in accordance with applicable provisions of local, state, and federal codes along with all permits covering this work. Contact the Port for copies of permits. None, some, or all permits may be included with the bid documents.

B. Subsurface Conditions:

The Contractor shall make its own determinations and conclusions regarding the methods and procedures to be used for pile installation, subject to the requirements of this Section.

PART 2 – PRODUCTS

2.01 STEEL PIPE

A. All pipe shall be new. Fabricate pipe from steel plate with diameters and wall thicknesses as indicated on the Drawings. Conform to the requirements of ASTM A 252, Grade 3, welded or seamless, with a minimum yield strength of 50 ksi, and the additional requirements in this paragraph.

B. Limit the variation in the outside circumference of the pipe to 1% of the outside circumference of the pipe or 3/8 inch, whichever is less, from the corresponding diameter shown on the Drawings.

C. Limit the difference between the major and minor outside diameter of the pipe to 1% of the specified outside diameter of the pipe or 1/4 inch, whichever is less from the corresponding diameter shown on the Drawings.

D. Limit the variation in pipe wall thickness at any point to not more than 5 percent under the nominal wall thickness indicated on the drawings unless otherwise approved by the Port.

E. Do not allow pipe straightness to deviate from a straight line parallel to the centerline of the pipe more than +/- 1/8 inch per 10 feet of length, but not to exceed the smaller of 3/8 inch or the requirements of API 5L, Section 7.6 for steel pipe straightness.

F. Limit the variation in edge alignment for abutting steel pipe ends to 0.1875 times the wall thickness, with a maximum allowable variation of 1/16 inch.

G. Perform welds to make pipe at a permanent manufacturing facility using either an automatic fusion weld process or an electric resistance weld process. Provide complete joint penetration welds only.

H. Perform non-destructive testing (NDT) on 100 percent of each longitudinal, circumferential, and spiral welds made at the permanent manufacturing facility. Use either radiographic, radioscopic, real-time imaging systems, or ultrasonic methods of NDT that are in conformance with the requirements of AWS D1.1 or API 5L unless otherwise approved by the Port. Provide records of this testing to the Port prior to delivery of pipe. For repairs, conform to the requirements of AWS D1.1, Section 6, for cyclically loaded non-tubular connections subject to tensile stress. If repairs are required in a portion of the weld, perform additional NDT on

100 percent of the repairs. Perform additional NDT on both sides of the repair for a length equal to 10 percent of the length of the pipe outside circumference. After all NDT is performed on the repair, and if more repairs are required that have a cumulative length equal to or more than 100 percent of the length of the pipe outside circumference, perform NDT on the entire splice weld.

2.02 STEEL PILING

A. Fabricate piling from steel pipe meeting the requirements of the paragraph STEEL PIPE.

B. Provide ASTM A 572, Grade 50 plate for all connections unless otherwise indicated on the Drawings.

C. Limit the number of splices to a maximum of one per pile. See the Drawings for additional requirements.

D. Provide a square and blunt end at the ends of each pipe pile.

E. Perform welding at splices in accordance with AWS D1.1 using certified welders, welding operators, and qualified joint welding procedures.

1. Provide splices with complete penetration butt welds using the reviewed welding procedure. Construction splices to maintain the true alignment and position of the pieces of pipe. Perform testing including ultrasonic testing of all pile splices in accordance with AWS D1.1 procedures.

2. Note that ASTM A 252 Grade 3 is not a prequalified base material under AWS D1.1. Prequalify all weld procedures.

3. Provide girth weld alignment conforming to AWS D1.1, Paragraph 5.22.3.1.

4. Use weld filler material conforming to the requirements of AWS D1.1 Table 3.1 for ASTM A 709 Grade 50 base material.

5. Use minimum preheat and interpass temperatures conforming to AWS D1.1 Table 3.2 for ASTM A 709 Grade 50 base metal.

6. Use minimum 1/4 by 2 1/2 backing rings for pipe splices.

F. Coat the piles as specified in Section 05 55 00 – Metal Fabrications and Section 09 96 00 – High Performance Coatings, to the lengths indicated on the Drawings.

2.03 PILE ORDER LENGTHS

Use a minimum of the length indicated on the Drawings between cutoff elevation and pile tip elevation plus adequate additional length to account for any cutoffs required.

2.04 PILE CAPS

Provide a pile cap on each pile at the concrete floats with a 60 degree conical point, constructed from fiberglass, white in color, with a minimum wall thickness of 1/8". Provide pile caps supplied by Cheyenne Manufacturing, Inc., P.O. Box 25, Brush Prairie, WA 98606; Phone 1-800-424-7575 or 1-360-574-7771; E-mail info@cheyennemfg.com; or equal approved by the Port.

PART 3 – EXECUTION

3.01 GENERAL

A. Do not exceed 90 percent of specified yield strength the pipe in the pile section during handling or installation.

B. Install all piles with fixed-leads. The use of hanging or swinging leads may be allowed if approved by the Port. Fix leads at the top and bottom during pile-installation operations. Do not use a follower.

C. Install each pile to the minimum tip elevation shown on the Drawings.

D. Once installation has started, install pile continuously until reaching the minimum tip elevation. Do not pause voluntarily or interrupt installation.

E. Install each pile in the designated location, obtain the required penetration for each pile, and meet the pile alignment tolerances.

F. Survey as-installed locations of piling and provide a written record of plan location, tip elevation, and top elevation for each pile to the Port within 48 hours of installing each pile. If not submitted within the specified time frame, the Port may retain a surveyor to record such information and will deduct the cost of such survey work from the contract. Do not erect timber members on piles without prior Port approval.

G. Pile Installation Tolerances

1. Plan Locations: Locate the top work points within 2 inches of the indicated plan locations unless a more stringent tolerance is required by the concrete float layout.

2. Plumbness: Maximum deviation from plumb equal to 1 inch per 10 feet of pile length unless a more stringent tolerance is required by the concrete float layout.

3. Cut-off Elevations: Maximum deviation from elevations indicated on the Drawings equal to 1/4 inch.

4. Do not pull, push, or manipulate piles to force them into position. Any pile that deviate more than the limits specified may be rejected by the Port.

H. Rejected Piles:

1. Any pile damaged during handling or installation, as indicated by breaks, buckling, cracks, splits, or other damage that adversely affects the capacity, performance, durability, function, coating, or treatment of the pile, as determined by the Port.

2. Any pile not meeting the installation tolerances listed above.

3. Any pile that does not reach the prescribed tip elevation shown on the Drawings.

4. The Port may direct that a rejected pile be removed and reinstalled in a location determined by the Port, or removed and replaced with a new pile installed in a location determined by the Port, or that a new pile be installed adjacent to the rejected pile and be incorporated into the structure. The Port may direct that rejected piles be cut off at the mudline. Rejected, broken, and cut off piles shall be removed and disposed of at no additional cost to the Port. The Port shall not incur any design and construction costs resulting from rejected piling, including cost of rejected piles, cost of new piles, or modifications to structures.

I. Daily Pile-Installation Records: For each pile installed, submit a record in accordance with the paragraph “SUBMITTALS”. In addition, record all unusual occurrences during installation.

3.02 STEEL PILING

A. Handling and Storage:

Handle steel piling by the use of bridles, strong backs, or other rigging, which will prevent permanent pile deformations and coating damage. Store piling on level ground or timber blocking so that the axis of each pile is maintained in a straight line and the coating system is not damaged, chaffed, crushed, or cracked.

B. Installation:

1. Install steel piling in true line and position. Remove obstructions before proceeding with pile installation, do not use a crooked alignment to avoid interference from obstructions.

2. Install steel piling with a vibratory hammer. Use a hammer equipped with a suitable “gripping jaw” shaped to fit the particular pile being installed.

3. Remove any pile damaged in installation, as directed by the Port, or installed at an incorrect location and install another pile in its place at no additional cost to the Port.

C. Cutoff:

1. If required, cut off piles level at the elevations indicated on the Drawings. Do not allow pile cutoffs to fall into the water or inside the pipe pile. Prevent all debris from cutting from falling into the water.

2. Install conical pile cap in accordance with pile cap manufacturer’s recommendations.

D. Pile Coating Repair:

Repair coating damaged during handling, storage, installing, reinstalling, cutoffs, or connection installation (piles to pile caps) in accordance with approved repair procedures outlined in Section 09 96 00 – High Performance Coatings.

3.03 OBSTRUCTIONS

Where obstructions inhibit or prevent piles from being installed or installed to the prescribed tip elevation, use special methods as required, including spudding,

predrilling, or other proposed means approved by the Port, at no additional cost to the Port. Do not jet piles.

END OF SECTION

SECTION 33 7900
SITE GROUNDING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.02 REFERENCES

A. ASTM B8.

B. NFPA 70 (National Fire Protection Association) – National Electrical Code.

C. ANSI/UL 467 - (Underwriter's Laboratory) - Grounding and Bonding Equipment.

1.03 QUALITY ASSURANCE

A. Listing and Labeling: Provide electrical components, devices, and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for specific types, sizes, and combinations of conductors and connected items.

B. Comply with IEEE 837 and UL 467.

C. Comply with IEEE Std. 142 (Green Book).

D. Comply with NFPA 70.

E. Comply with IEEE C2 for overhead-line construction and medium-voltage underground construction.

1.04 SUBMITTALS

A. Submit product data for the following:

1. Grounding conductors and cables.
2. Grounding connectors.
3. Grounding electrodes.
4. Ground bus.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductor Fittings:

a) Erico Inc.

b) Chance/Hubbell.

c) Copperweld Corp.

d) Erico Inc.; Electrical Products Group.

e) Framatome Connectors/Burndy Electrical.
f) Ideal Industries, Inc.
g) ILSCO.
h) Kearney/Cooper Power Systems.
i) Lyncole XIT Grounding.
j) O-Z/Gedney Co.
k) Raco, Inc.; Division of Hubbell.
l) Thomas & Betts, Electrical.

2. Grounding Connectors and Rods:
   a) Erico.
   b) ILSCO.
   c) Lyncole XIT Grounding.
   d) O-Z/Gedney.
   e) Raco, Inc.; Division of Hubbell.
   f) Thomas & Betts

2.02 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26, Section “Low Voltage Electrical Power Conductors and Cables.”

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded.

F. Bare Copper Conductors: Assembly of stranded conductors, ASTM B 8.

G. Copper Bonding Conductors:
   1. Bonding Conductor: #4 or #6 AWG, stranded copper conductor.
   2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Bonding Straps: Soft copper.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.03 CONNECTORS

A. Pressure Connectors: High-conductivity-plated units.

B. Bolted Connectors: Heavy-duty, bolted-pressure-type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer’s written instructions.

2.04 GROUNDING ELECTRODES

A. Ground Rods: Solid copper clad steel, 3/4-inch diameter by 10-feet length.

PART 3 - EXECUTION

3.01 APPLICATION

A. Copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel, rail, rebar and for underground connections.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.02 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits unless otherwise noted.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Nonmetallic Raceways: Install an equipment grounding conductor in all nonmetallic raceways unless they are designated for telephone or data cables.

3.03 INSTALLATION

A. Ground Rods: For service entrance locations install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment.

1. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp.
2. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts.
3. Install straps only in locations accessible for maintenance.

3.04 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For #8 AWG and larger, use pressure-type grounding lugs. #10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If non-metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing.

1. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing.
2. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.05 IDENTIFICATION

A. Identify grounding system components as required by the Authority Having Jurisdiction and as specified.

3.06 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
   a) Measure ground resistance without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b) Test by one of the following methods for resistance measurement:
      1) Perform fall of potential test per IEEE Standard No. 81, Section 9.04 on the main grounding electrode or system for each substation and building.
      2) Perform the two-point method test per IEEE No.81 Section 9.03 to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.
      3) Alternate Method: Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point. Conduct test by passing a minimum of ten amperes dc current between ground reference system and the ground point to be tested. Measure voltage drop and calculate resistance by voltage drop method.
   c) Test Requirements:
      1) Equipment Rated 500 kVA and Less: 10 ohms.
      2) Equipment Rated 500 to 1000 kVA: 5 ohms.
      3) Equipment Rated More Than 1000 kVA: 3 ohms.
      4) Substations and Pad-Mounted Switching Equipment: 5 ohms.
      5) Manhole Grounds: 10 ohms.
   d) Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.
2. Record test results on a Ground Resistance Test Report form for inclusion with O & M Manuals.

B. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes.

1. Identify each ground rod by letter in alphabetical order, and key to the record of tests and observations.
2. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PAYMENT:

A. Payment for all work in this Section shall be as stated in Section 01 2000.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to this Work as if specified in this Section. Work related to this Section is described in:

A. Section 03 10 00 – Concrete Forming and Accessories

B. Section 03 30 00 – Cast-in-Place Concrete

C. Section 03 60 00 – Concrete Repair

D. Section 05 50 00 – Metal Fabrications

E. Section 06 10 00 – Rough Carpentry

F. Section 31 62 00 – Steel Pipe Piles

1.02 DESCRIPTION OF WORK

The extent and location of the precast concrete float work are indicated on the Drawings and in these Specifications. The work includes the provision of precast, non-prestressed concrete floating dock modules herein referred to as precast floats, connecting the precast floats into a floating dock, providing for grounding of the floating dock on a daily basis, and all other items relating to the floating dock system as required for a complete installation that meets the requirements of the contract documents.

1.03 REFERENCES

Use the most current edition at time of bid unless otherwise indicated.

A. American Concrete Institute (ACI) Specifications and References, designated by basic reference in this section. In ACI references, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Port.

B. Specifications by ASTM International (ASTM), designated by basic reference in this Section

C. Precast/Prestressed Concrete Institute (PCI) Handbooks and Manuals, designated by basic reference in this Section.

D. American Welding Society (AWS) codes, designated by basic reference in this Section.

1.04 QUALITY ASSURANCE

A. Precast Float Manufacturer Experience: Precast floats shall be the product of a manufacturer specializing in the design and production of precast concrete floats with a minimum of 10 years of experience in the manufacture of precast concrete floating docks.

B. PCI Quality Certifications: PCI MNL-116. At the precast manufacturer's option, in lieu of core samples, and ACI 318, full scale load tests may be performed. Perform on randomly selected precast floats, as directed by the Port.

C. The Port will inspect precast floats at its discretion. Give notice to the Port 14 days prior to transporting floats from the fabrication facility. Provide access to the Port for these inspection(s) at any time (fabrication, installation, etc.) and at no additional cost to the Port. Neither the exercise nor waiver of inspection at any time affects the Port's right to enforce contract provisions after precast floats are handled, transported, or installed.

1.05 SUBMITTALS

A. Prepare bids based on the products contained in this Section or obtain written approval of any substitution. Do not begin fabrication until submittals and substitutions have been reviewed and approved by the Port. Clearly identify and include any proposed substitutions in submittals.

B. Incomplete submittals or submittals without appropriate references will be returned without being reviewed. Obtain approval of submittals from the Port before fabrication.

C. List of at least 10 installations in the United States. Provide project name, owner, contact name, e-mail address, and telephone number for a minimum of 5 installations in the past 5 years.

D. Concrete mix design, including a list of materials including type; brand; source and amount of cementitious materials and admixtures; and applicable reference specifications.

E. Concrete test reports, showing that the mix has been successfully tested within the past six months and produces concrete with the properties specified and is suitable for the job conditions.

F. Foam fill materials and glue, including quality control testing of foam fill material certifying that foam fill properties meet the requirements of this Section and requirements for curing glue.

G. Ballast and supplemental floatation details, if required, including materials and methods of installation and how materials are secured.

H. Repair procedures for cracks, spalls, honeycombs, and other distress or damage.

I. Precast Float Design Calculations: Submit calculations reflecting design conforming to requirements of the Drawings and these Specifications. Design calculations shall be prepared and sealed by a Washington state licensed professional engineer, and submitted for approval prior to fabrication. In addition to member and connection sizing calculations, submit calculations for the dock system which include, as a minimum, the following information.

1. Design codes and references used to develop the calculations.

2. Loads used in design (dead, live, wind, current, berthing, mooring, debris, handling, installation, etc.) and load combinations used in design.

3. Material properties of all components of the floating dock.

4. Distribution of reactions from guide pile support points and anchorage attachment points throughout the floating dock.

5. Timber wales, pin connections, plates, and other hardware required to connect individual precast floats into a floating dock.

6. Tolerances to accommodate as-constructed guide pile locations and existing abutment location.

J. Precast Float Design Drawings: Submit drawings indicating complete information for the fabrication, handling, and erection of the precast floats. Do not use reproductions of contract drawings. Design drawings shall be sealed by a Washington state licensed professional engineer, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:

1. Floating dock layout including guide pile locations and existing abutment.

2. Assembly drawings including marking of floats for assembly.

3. Material properties of all components of the floating dock.

4. Reinforcing steel details.

5. Pin connections, plates, and other hardware between floats and similar connections, plates, and hardware between float and existing abutment including coatings.

6. Location, details, and anchorage of handrails.

7. Location, details, and anchorage of cleats.

8. Wale sizes, splice patterns, and treatment requirements.

9. Pile guide connections to the floating dock, including anchorage to the precast floats, tolerances to accommodate variations in guide pile locations, coating system, rub strips, and all other components.

10. Lifting and assembly inserts and embedded items.

11. Dimensions and surface finishes of precast floats.

12. Installation sequence and handling requirements.

K. Precast float and floating dock as-built (record) drawings including as-constructed guide pile locations and connections to the floating dock. Include existing abutment location.

L. Daily concrete test reports, including compressive strength, unit weight, and entrained air. Provide to the Port within 72 hours of the test.

M. Written warranty.

1.06 DESIGN REQUIREMENTS

A. General: Design precast floats (including connections) for the design load conditions and spans indicated, using ACI 318 and the PCI MNL-120. Design precast floats for handling without cracking in accordance with the PCI MNL-120.

B. Dock Loading: Design precast float and anchorage systems for the following load conditions as a minimum. Combine load cases based upon their probability of simultaneous occurrence, and in accordance with applicable codes and standards. Include load combinations identified in this section. Handrail design loads are also included.

1. Dead Load: for the completed float system, including all work of other trades.

2. Uniform Live Load: 40 pounds per square foot applied to any/all combination of areas on the float deck.

3. Concentrated Live Load: 650 pounds placed at any point on the float deck not closer than 12 inches from the edge of the float.

4. Grounding Load: design floats to withstand loads associated with grounding on the grounding support system.

5. Combined Current, Wave and Debris Impact Loads:

   i. Uniform 400 pounds/foot linear current load applied in any direction.

   ii. Wave load corresponding to a stillwater wave profile of a wave with a significant height of 1.6 feet and a period of 3 seconds.

   iii. Concentrated 5,600 pound debris load applied in any direction.

6. Wind Load: 30 pounds per square foot acting simultaneously on the projected area of the dock and of the moored vessels without any regard for any “shadowing” effect that may occur from boats shielding floats from wind, or vice versa. For vessel area, assume an average height of 6 feet above the waterline and full occupancy. For vessel length, assume 40 feet maximum.

7. Berthing Load: Uniform berthing load of 200 pounds per linear foot horizontal and concentrated berthing load based on a 40-foot vessel (20,000 pound weight) striking the precast float at 3 feet per second at an angle of 10 degrees from the float edge. These loads do not occur simultaneously.

8. Mooring Load: as a minimum, design precast float, attachment points, and all other connections for the capacity of the mooring hardware identified in this Section and on the Drawings, with a line pull acting in any direction and up to a 45 degree angle from the horizontal.

9. Load Combinations: as determined by the Washington state licensed professional engineer for precast floats, and including the following as a minimum.

   i. Dead load plus all handling loads including transport and assembly.

   ii. Dead load plus uniform live load, with float unsupported span length equal to the wavelength of the design wave.

   iii. Dead load plus uniform live load, with floats in a grounded condition.

   iv. Dead load plus concentrated live load plus wind load plus berthing load.

   v. Dead load plus concentrated live load plus wind load plus combined current, wave and debris impact loads.

10. Handrail Live Loads: 50 pounds per lineal foot uniform load applied in any direction at the top. In addition, a single concentrated load of 200 pounds applied at any direction at any point along the top. It is assumed that the uniform load and the concentrated load do not act concurrently.

C. Performance:

1. Size precast float modules as indicated on the Drawings with a single module attaining the indicated float width (excluding wales).

2. Size precast floats to meet the following freeboard requirements.

   i. Dead load only: between 15 inches and 17 inches. Design each precast float to float level under dead load only and to be flush with the adjacent floats. Maximum out of level tolerance for transverse and longitudinal slope shall be 1 inch per 10 feet.

ii. Dead load and concentrated live load: not less than 13 inches.

iii. Dead load and uniform live load: not less than 5 inches.

3. Provide a skid-resistant finish on all walking surfaces.

4. Provide pile guides supported by the deck and containing solid rubbing surfaces.

1.07 WARRANTY

Furnish a written warranty stating the following.

A. Components of the precast floats, including pile guides, shall be free of defects in material and workmanship for a minimum period of 5 calendar years from the date of project substantial completion.

B. Design freeboard of the float system shall not lose more than 1-inch of freeboard over the life of the warranty period.

C. All defective components evident during the warranty period shall be removed and replaced, without cost to the Port, within 90 days of notification.

PART 2 – PRODUCTS

2.01 CONCRETE MIX DESIGN

Provide a concrete mix design meeting the following requirements.

A. Minimum compressive strength at 28 days: 4,000 psi per ASTM C 39.

B. Minimum cement content equal to 50 percent of total mass of cementitious materials.

C. Fly ash content not to exceed 25 percent of total mass of cementitious materials.

D. Ground granulated blast furnace slag content not to exceed 50 percent of the mass of cement.

E. Maximum water to cementitious materials ratio: 0.40

F. Concrete unit weight: 120 to 150 pounds per cubic foot per ASTM C 138 or ASTM C 567

G. Air Entrainment: 5% to 8% per ASTM C 173 or ASTM C 231

2.02 PRECAST FLOAT MATERIALS

A. Cementitious Materials:

1. Cement: ASTM C 150, Type II or I/II, minimum 6 sacks per cubic yard, with tricalcium aluminate (C3A) content limited to not less than 6 percent and not more than 8 percent.

2. Fly Ash: ASTM C 618 Type F, except maximum allowable loss on ignition shall be 2 percent.

3. Ground Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Water: fresh, clean, and potable.

C. Aggregates: ASTM C 33 or ASTM C 330, Size 8 (3/8 inch), except as modified herein. Obtain aggregates from one source. Do not use aggregates which contain any substance which may be deleteriously reactive with the alkalies in the cement. See Section 03 30 00 – cast-in-Place Concrete for required tests to evaluate aggregate reactivity.

D. Nonshrink Grout: ASTM C 1107 and the following additional requirements.

1. Plastic height change of 0% to +4% in accordance with ASTM C 827.

2. Hardened height change of 0% to 0.3% in accordance with ASTM C 1090.

3. Fluid consistency at 25 to 30 seconds in accordance with ASTM C 939.

4. Minimum working time of 30 minutes.

5. Minimum compressive strength of 7,500 psi at 28 days when prepared in fluid consistency in accordance with ASTM C 109.

6. Contains no aluminum powder.

E. Admixtures

1. General: If admixtures are required by design, comply with the requirements shown below. Use in accordance with manufacturer's recommendations and use only where appropriate for both climatic conditions and construction needs. Do not use calcium chloride or admixtures containing chlorides from other than ingredient impurities.

2. Air-Entraining: ASTM C 260

3. Water Reducing: ASTM C 494, Type A, E, or F

4. High Range Water Reducing: ASTM C 494 Type F or ASTM C 1017

F. Reinforcement

1. Reinforcing Bars: ASTM A 706, Deformed Grade 60, hot-dip galvanized in accordance with ASTM A 767.
2. Welded Wire Fabric: ASTM A 1064, hot-dip galvanized in accordance with ASTM A 1060. Use flat sheets of welded wire fabric only, do not use rolled sheets.

G. Metal Components and Accessories

1. Inserts: ASTM A 47, Grade 32510 or 35018, or ASTM A 27 Grade U-60-30, unless otherwise approved by the Port.

2. Structural Steel: ASTM A 36.

3. Bolts, Nuts, and Washers: ASTM A 36, ASTM A 307, or ASTM F 1554 Grade 36; ASTM A 563, and ASTM F 844, respectively. Provide wale rods that are continuous transversely across the float, with a minimum diameter of 1 inch. Place all wale rods within PVC sleeves cast into the precast floats.

4. Cleats: ASTM A 27 Grade 65-35, heavy-duty cleat pattern, unless otherwise approved by the Port.

5. Hot-dip galvanize all metal accessories in accordance with ASTM A 123 or ASTM A 153 as applicable.

H. Handrails: see Section 05 50 00 – Metal Fabrications.

I. Foam Core

1. Closed cell, expanded polystyrene (EPS) per ASTM C 578, Type I, with additional requirements as specified in this Section. Glue foam core laminations with low solvent glue. Do not make foam core from more than four laminated sections. Repair delaminations prior to placement of concrete in a manner acceptable to the Port. Do not use reground material unless approved by the Port in writing.

2. Unit Weight: 1.0 to 1.10 pounds per cubic foot

3. Flexural Strength: 25 pounds per square inch minimum.

4. Maximum Water Absorption: 4 percent (by volume)

5. Dimensional Tolerance: +/- 1/8 inch

6. Low Solvent Glue: as recommended by the foam fill manufacturer for permanent installations in a marine environment.

J. Rub Strips: "Extra-Heavy Duty Utility Fender" by Henderson Marine Supply, Inc. (800-523-1586) or equal approved by the Port prior to float installation. Attach with Type 316 stainless steel hardware.

2.03 PRECAST FLOAT FABRICATION

A. Precast Floats

Follow PCI MNL-116 unless otherwise directed in this Section. Cast precast floats monolithically. Do not use cold joints. Provide a minimum thickness of 2 inches for all float elements. Construct precast float decks to drain freely with no floodable enclosed spaces. Completely surround foam core with concrete elements.

B. Forms

Brace forms to prevent deformation. Use forms that produce a smooth, dense surface. Chamfer exposed edges 1/2 inch, unless otherwise indicated. Form tolerance shall not exceed 1/8 in. dimensions indicated on shop drawings. Reject floats that are more than 1/2 in. out of square when measure diagonally.

C. Reinforcement Placement

Follow ACI 318 for placement and splicing. Reinforcement may be preassembled before placement in forms.

D. Concrete

1. Mixing: ASTM C 94. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

2. Placing: Follow ACI 309R for consolidation of concrete. Vibrate concrete internally and/or externally to assure a smooth, dense finish. Follow ACI 305.1R for hot weather concreting and ACI 306.1 for cold weather concreting, unless otherwise specified. Do not place concrete while the atmospheric temperature is below 40 degrees F, unless heating equipment is used immediately after placing to maintain the concrete surface temperature at or above 45 degrees F. Do not allow the temperature of concrete to exceed 80 degrees F at the time of placement.

3. Concrete Curing: Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 45 degrees F and 145 degrees F. When accelerated curing is used, moist cure for four hours and then apply heat at a controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts. Cure precast floats for a minimum of fourteen days prior to transporting, launching and assembly unless otherwise approved by the Engineer.

4. Concrete Testing: Performed by a testing agency accredited in accordance with ASTM C 1077. Take a minimum of four cylinders per day, 4-inch diameter by 8-inches long, in accordance with ASTM C 31 and ASTM C 172. Test cylinders in accordance with ASTM C 39; one each at 1 day, 7 days, and 28 days after placement, with one cylinder held in reserve. Test for unit weight and entrained air from the same material sample as used for the compressive test cylinders.

E. Surface Finish

1. Cracks, Spalls, and Honeycombs: Precast floats containing hairline cracks which are visible and are less than 0.02 inches in width, may be accepted, except that cracks larger than 0.007 inches in width for surfaces exposed to the weather shall be repaired. Precast floats which contain cracks greater than 0.02 inches in width shall

be approved by Engineer for use prior to being repaired. Any precast float that is structurally impaired or contains spalls or honeycombed section(s) deep enough to expose reinforcing steel shall be rejected, as determined by the Engineer.

2. Unformed Surfaces: Provide a steel troweled and broom finish for dock deck surface. Orient slip resistant broom finish transverse to dock orientation. Provide a 3/8 in. tooled radius with a minimum 1 1/2 in. wide, smooth, hard steel finished face at all deck edges.

3. Formed Surfaces: PCI MNL-116, provide a Standard Grade Finish for both exposed and unexposed surfaces, except repair defective areas including minor honeycombs and pits greater than one square inch surface area or 1/4 inch maximum depth. Provide edges perpendicular to the surface at defective areas and patch with nonshrink grout.

F. Precast Float Identification

Clearly identify all precast floats on one side and one end, between the bottom of the wale and the waterline. Include name of manufacturer, date of manufacture, specific float type, and job number.

2.04 PRECAST FLOAT HANDLING

Lift and support precast floats at the lifting and support points indicated on the shop drawings. Store precast floats off the ground. Separate precast floats with battens placed across the full width of each bearing point. Protect precast floats from weather, marring, damage, and overload.

PART 3 – EXECUTION

3.01 SURFACE REPAIR

Prior to erection, and again after installation, check precast floats for flaws or damage, such as cracking, spalling, and honeycombing. Repair or remove and replace precast floats that do not meet the surface finish requirements specified in the paragraph “PRECAST FLOAT FABRICATION” and provide new precast floats.

3.02 DELIVERY AND STORAGE OF PRECAST FLOATS AT THE SITE

Follow the requirements of the paragraph “PRECAST FLOAT HANDLING”.

3.03 LAUNCH AND ASSEMBLY

Precast floats may be launched after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Assemble precast floats in accordance with the approved shop drawings. See PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Brace precast floats, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads.

3.04 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections tight and nick threads to prevent loosening.

3.05 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A 780 Annex A1 for galvanized surfaces damaged by handling, transporting, cutting, welding, bolting, or acid washing. Do not heat surfaces to which repair material has been applied.

3.06 GROUTING

Clean and fill indicated areas solidly with nonshrink grout. Remove excess grout before hardening.

END OF SECTION