

INVITATION FOR BIDS

**SAN FRANCISCO BAY AREA
WATER EMERGENCY TRANSPORTATION AUTHORITY**

MISSION BAY INTERIM FERRY LANDING

IFB #19-005

VOLUME 3

TECHNICAL SPECIFICATIONS

DIVISION 5 AND 31

JUNE 7, 2019

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SCOPE

The work of this section consists of fabricating and installing structural steel components for the Pier 48.5 Interim Ferry Landing Project including but not limited to the steel landing platform, float gangway landing track modification, and associated steel accessories as shown on the construction drawings. Structural

1.2 REFERENCES

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

A. American Institute of Steel Construction (AISC)

1. AISC 201 Certification Program for Structural Steel Fabricators
2. AISC 317 Manual of Steel Construction, Volume II Connections
3. AISC 325 Steel Construction Manual, 15th ed.
4. AISC 326 Detailing for Steel Construction

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code

C. American Society for Testing and Materials (ASTM)

1. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A143 Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
3. ASTM A153 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings

on Iron and Steel Hardware

4. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
5. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
6. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium- Vanadium Structural Steel
7. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
8. ASTM A992 Specification for Structural Steel Shapes
9. ASTM F436 Standard Specification for Hardened Steel Washers
10. ASTM F1554 Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
11. ASTM F3125 Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

1.3 SYSTEM DESCRIPTION

Provide the structural steel system complete and ready for use. Structural steel systems including materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 317 and AISC 325.

1.4 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings showing all materials, member shapes and sizes, dimensions, quantities, connection details, and accessories.
2. Shop Drawings shall be provided for all specially fabricated items, and catalog sheets for all standard manufactured items.

B. Manufacturers Product Data: Submit product data for welding electrodes and rods.

C. Certificates: Submit certification from manufacturers, suppliers, fabricators, et al. attesting that the following materials conform to the agreement requirements:

1. Steel

2. Bolts, Nuts, and Washers
3. Fasteners
4. Galvanizing
5. Pins and Rollers
6. Welding Electrodes and Rods
7. Welding Procedures and Qualifications
8. AISC Quality Certification

1.5 CERTIFICATIONS

A. Welding Procedures and Qualifications

1. Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualifications tests. If the qualification date of the welding operator is more than one year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.
2. Conform to all requirements specified in AWS D1.1/D1.1M.

B. AISC Quality Certification: Submit certification for work fabricated in an AISC Certified Category Standard fabrication plant.

1.6 QUALITY ASSURANCE

- ### A. Fabrication Drawing Requirements: Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings must not be reproductions of Contract Drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Any deviations from the details shown on the contract drawings must be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the Contract Drawings.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

- A. Carbon Steel: All steel shall be coated galvanized.
 - 1. ASTM A572, Grade 50 Steel plate, unless noted otherwise
 - 2. ASTM A572, Grade 50 Channels and Angles
 - 3. ASTM A992, Grade 50 Wide Flange Shapes, Tees

2.2 STEEL WELDS

A. Carbon Steel

- 1. Welding Electrodes and Rods: AWS D1.1/D1.1M, Minimum quality: E70XX

2.3 BOLTS, NUTS, AND WASHERS

A. Carbon Steel

- 1. Bolts between steel components shall conform to ASTM F3125, hot-dip galvanized; and where exposed, shall be of the same color and finish as the metal to which applied. Grade A325 unless noted otherwise.
- 2. Anchor bolts and thru bolts shall conform to ASTM F1554, hot-dip galvanized.
- 3. Nuts shall conform to ASTM A563, hot-dip galvanized.
- 4. Washers shall conform to ASTM F436, hot-dip galvanized.

PART 3 - EXECUTION

3.1 FABRICATION

- A. All work shall conform to the approved Shop Drawings, Construction Drawings and this specification. Construction details, finishing details and colors shall be consistent throughout. Work shall be accurately set to established lines and elevations, and securely fastened in place. Cutting, drilling, and punching shall produce clean true lines and surfaces. Exposed surfaces of work shall have a smooth finish.
- B. Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under AISC 201-16.
- C. Shop splices of members will be permitted only where indicated on the Construction Drawings. Splices not indicated require the approval of the Owner's Representative.

- D. Adequate drainage holes must be drilled to eliminate water traps. Hole diameter must be 1/2 inch minimum and location must be indicated on the shop drawings.
- E. Seal ends of HSS or pipe structural members with cover or end plates.

3.2 STORAGE

- A. Material shall be stored in such a manner and location to minimize possibility of deterioration or damage.

3.3 CONNECTIONS

- A. Do not tighten anchor bolts set in concrete with impact torque wrenches.
- B. Punch, sub-punch and ream, or drill bolt and pin holes perpendicular to the surface of the member.
- C. Holes shall not be cut or enlarged by burning.
- D. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.4 GAS CUTTING

- A. Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing.
- B. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the City of Alameda.

3.5 WELDING

- A. Provide AWS D1.1/D1.1M qualified welders, welding operators and tackers. The Contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding; including welding done using prequalified procedures.
- B. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.
- C. Parts to be welded shall be free of dirt, grease, and other contaminants, and shall fit up properly for sound welding. Surfaces to be welded shall not be cut with oxygen. Sawing, shearing, or machining may be used.
- D. Temporary welds, run-off plates, and backing strips shall be removed from exposed surfaces and ground smooth.

3.6 FINISHING

- A. All exposed carbon steel elements shall be galvanized.

3.7 GALVANIZATION

- A. All steel shall be galvanized.
- B. Galvanize steel members, fabrications, and assemblies after fabrication by the hot-dip process in accordance with ASTM A123 / 123M.
- C. Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153 / 153M.
- D. Safeguard products against steel embrittlement in conformance with ASTM A143.
- E. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
- F. Thoroughly clean surfaces of rust, scale, grease, and foreign matter prior to galvanizing.
- G. Galvanize after fabrication where practicable.
- H. Galvanizing Repair
 - 1. Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting.
 - 2. Galvanized items that have been damaged shall be thoroughly cleaned and recoated using the galvanizing repair paint specified.
 - 3. The coating shall be applied according to manufacturer's recommendations and have a combined dry film thickness of not less than six (6) mils.
 - 4. Do not heat surfaces to which repair paint has been applied.

3.8 WELD TESTS

- A. Visual Inspection
 - 1. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect 100% of the welds and mark welds, including fillet weld end returns.
- B. Nondestructive Testing
 - 1. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested by radiographic

or ultrasonic testing, as approved by Owner's Representative. When all welds made by an individual welder are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

C. Test Frequency

Weld Type	Test Type	Connections to be Tested
Groove weld	Ultrasonic	100%
Fillet weld	Magnetic	20%

END OF SECTION

SECTION 31 62 16**STEEL PIPE PILES****PART 1 - GENERAL****1.1 SCOPE**

This Section provides the minimum requirements for fabrication, testing, inspection, and installation of all steel pipe piles, including fiberglass cap at the top of piles, as indicated on the Construction Drawings (drawings) and specified herein.

This specification pertains to the following:

- A. Guide piles of the float
- B. Landing platform steel piles

1.2 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel Framing

1.3 REFERENCES

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

- A. American Petroleum Institute (API)
 - 1. API 5L Specification for Line Pipe
- B. American Welding Society (AWS)
 - 1. AWS D1.1 Structural Welding Code - Steel
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM A252 Standard Specification for Welded and Seamless Steel Pipe Piles
 - 2. ASTM A370 Standard Test Methods and Definitions for Mechanical Testing

of Steel Products

1.4 GEOTECHNICAL INVESTIGATION AND FOUNDATION RECOMMENDATIONS

- A. For float guide piles and platform pile embedment at the site, refer to the construction drawings.
- B. For known site conditions, see the site boring logs.
- C. Subsurface Debris: The Contractor is alerted to the possibility of encountering old debris during pile driving. The Contractor is required to be prepared to deal with debris.
- D. Anticipated Construction Sequence for Float Guide Piles– Steel pipe piles will be driven or vibrated down to the tip elevation shown on the construction drawings.
- E. Anticipated Construction Sequence for Platform Pile – 18-inch diameter permanent steel pipe pile will be driven or vibrated down to the tip elevation shown on the construction drawings.

1.5 PERMITS

Piles shall be installed in compliance with all applicable local, state and federal environmental requirements.

1.6 SUBMITTALS

- A. Pile Installation Plan - Describe the method of transporting, handling, and installing piles, including marine equipment to be used and sequence of installation. Restrictions as shown on the Construction Drawings shall be included in the plan. Submit plan at least ten (10) days prior to delivery.
- B. Pile Installation Equipment - Provide description of the pile installation equipment and hammer specifications to be employed in the work in the plan. At a minimum, include the following:
 - 1. Make and model
 - 2. Steady state frequency or frequency range (cycles per minute)
 - 3. Vibrating mass weight (pounds)
 - 4. Amplitude (inches)
 - 5. Maximum pull capacity (tons)

6. Non-vibrating mass weight (pounds)
 7. Power pack description
 8. Means of turbidity control
 9. Casing or other means of maintaining the pile excavation through the overlying soil including Bay Mud
- C. Pile Placement Sequencing - Detail the installation sequence of the piles and the method proposed for controlling the location and alignment of piles, installing the piles through Bay Mud into soil while maintaining pile plumb.
- D. Shop Drawings:
1. Steel pipe piles: Show all locations, markings, layouts, materials, sizes, and shapes and indicate all methods of connection and bracing. Submit detail drawings of pile splices prior to fabrication.
 2. Field splice details: Stabbing points, blocks, shims, etc. required to align pile sections when working flat and in the leads.
 3. Pile installation procedure
- E. Manufacturers Product Data
1. Welding electrodes and rods
 2. Coating system
 3. Fiberglass pile top cones
- F. Testing and Inspection Reports
- G. Certificates: Submit certification from manufacturers, suppliers, fabricators, etc. attesting that the following conform to the requirements:
1. Steel pipe piles
 2. Welding electrodes and rods
 3. Welding procedures and qualifications
 4. AISC Quality Certification. Alternatively, AISC Quality Certification may be waved for a steel pipe fabricator that has provided steel pipe piles for other WETA projects; in this case the required submittals are A. a copy of their QA/QC procedures equivalent to AISC quality criteria and B. a list of the other WETA projects where the QA/QC plan was applied.

5. Coating System
 6. Paint marking compatibility approval by coating manufacturer.
 7. Steel Plate Fabricator's Association (SPFA) certification when plates are used to fabricate pipe.
- H. Hydro-acoustic and Above-Water Monitoring Plan - Submit a detailed hydro-acoustic, above-water, and biologic monitoring plan, conforming to project requirements for review.
- I. Pile Delivery and Handling Plan
- J. Pile Installation Records
1. Submit the proposed form for compiling pile driving records 10 days prior to commencement of work.
 2. Submit complete and accurate pile installation records within fifteen (15) calendar days after completion of installation.

1.7 TESTING AND INSPECTION

- A. Testing and inspection of the steel pipe piles shall be performed in accordance with the requirements in AWS D1.1. Hydrostatic testing may be omitted.
- B. Welder Qualifications shall be in accordance with the requirements in Contract Specification Section 05 12 00 – STRUCTURAL STEEL FRAMING.
- C. Shop Inspections
1. The fabricator shall perform, at his expense, normal quality control procedures in accordance with AWS D1.1, industry standards and his quality control manual. The Owner shall be allowed access to all parts of the Work at all times and shall be furnished such information and assistance by the Contractor and fabricator as may be required for a complete and detailed inspection.
 2. Special inspections will be performed by Owner's Representative in accordance with 2013 California Building Code Chapter 17 and the requirements herein.
 3. Fabrication inspection for pipe piles at the manufacturing plant are as follows:
 - a. Extent – Non-spirally welded pipe, for each pipe:
 - i. 100 percent VT all welds, both sides. If they fail to meet the tubular connections criteria of AWS D1.1 Table 6.1, they must be repaired.

- ii. For each straight length of weld, UT or RT inspect 100 percent of length of circumferential and 10 percent of length of longitudinal welds, and MT or PT inspect 20 percent of length of circumferential welds. For circumferential welds, distribute MT or PT inspection equally to each side of weld, 20 percent each inspectable side or face. For each straight length of weld, if no defects (rejectable indications) are found, no further inspection of that weld length is required.
 - iii. If one or more subsurface defects are found, UT or RT the remainder of the circumferential weld with defect(s), and another 10 percent of longitudinal weld with defect(s). If one or more subsurface indications are found in the longitudinal weld, inspect the remainder of the weld.
 - iv. If one or more surface defects are found, MT or PT inspect another 20 percent of the circumferential welds and 10 percent of the longitudinal welds. If one or more surface defects are found, MT or PT inspect the remainder of the weld.
- b. Extent – Spirally welded pipe, for each pipe:
- i. 100 percent VT all welds, both sides. If they fail to meet the tubular connections criteria of AWS D1.1 Table 6.1, they must be repaired.
 - ii. 20 percent UT or RT and 10 percent MT or PT the length of spiral weld and plate splice welds (MT 10 percent each inspectable side or face). If no defects are found, no further inspection is required. For MT or PT, inspect both sides of weld.
 - iii. If one or more subsurface defects are found, UT or RT inspect another 25 percent of the weld. If one or more subsurface defects are then found, inspect the remaining length of weld.
 - iv. If one or more surface defects are found, MT or PT inspect another 25 percent. If one or more surface defects are found, inspect the remaining length of weld.
 - v. When choosing portions of weld lengths to inspect, choose the length that appears most likely to contain defects. If this is not obvious, randomly select.
 - vi. MT or PT surface inspection is total per length and by side or face.
 - vii. If no defects are found in the first four pipes inspected, inspect the next four by VT, but only two of the four with MT and UT as described above. If no defects are found, inspect the next four by VT, but only one of the next four by MT and UT. If no defects are found, inspect the next eight, by VT, but only one of the eight by MT and UT. If no defects are found, repeat with the next eight. When defects are found, restart VT, MT, and UT inspection on each of the next four pipes.

- viii. Repaired weld lengths shall be inspected at 100 percent VT, MT or PT, and UT or RT. Welds with surface defects that did not fail UT or RT are not required to be UT or RT after they are repaired.
- ix. The Contractor shall be responsible for performing fabrication / erection / inspection at the pile manufacturing plant, as defined above.
- x. At the Contractor's option, inspection will be witnessed by the Contractor's Welding Inspector in conformance with the requirements of API 5L, Appendix H.
- xi. Records verifying that this testing was accomplished and that all tested welds were in conformance with these specifications shall be submitted with the manufacturer's mill certificate.

D. Field Inspections

- 1. After welds are completed, they shall be hand or power-brushed and thoroughly cleaned by the Contractor before field inspection.
 - 2. The Owner will perform 100 percent visual inspection of welding, in accordance with AWS D1.1.
 - 3. The Owner will engage the services of an independent inspector/laboratory to perform the ultrasonic testing.
 - 4. Ultrasonic testing will be performed in accordance with AWS D1.1 and the requirements herein to augment the visual inspection of all pile splice welds.
 - 5. Field splice weld inspection requirements for pipe piles follows:
 - a. Butt splice welds shall be nondestructively tested (NDT) from the outside in conformance with the requirements of AWS D1.1 as follows:
 - i. 100 percent VT.
 - ii. 100 percent MT or PT
 - iii. 100 percent RT or UT
- E. Correction of Defective Shop or Field Welds: Weld areas which contain defects based on AWS D1.1 shall be repaired in accordance with AWS D1.1 paragraph 5.26 by the Contractor at his expense. The repair shall conform to the requirements of AWS D1.1/D1.1M, Section 6, for cyclically loaded non-tubular connections subject to tensile stress. When pipe pile welds are VT and fail to meet the tubular connections criteria of AWS D1.1 Table 6.1, they must be repaired. When pipe pile shop welds or field splices are UT tested or are repaired and

retested, the Discontinuity Severity Classes A through D are as shown in AWS D1.1 Table 6.3 and the rejection/ acceptance criteria for the different classes are as indicated on that page of D1.1.

- F. Repair of the Coating System: Repair of the Coating System shall be at Contractor's expense and in accordance with coating manufacturer's instructions.
- G. Testing of Mechanical Properties: Results of testing material properties shall be in accordance with the material property specification used to fabricate the pipe piles (e.g., API 5L, ASTM 252). In addition, results of the following tests are required before the installation of piles can begin:

1. Tensile Tests:

- a. Test Specimens: Tensile test orientation shall be relative to the pile. At the option of the manufacturer, the specimen may be either full section, strip specimen or round bar specimen. The tensile testing procedure shall conform to the requirement of ASTM A370, Methods and Definitions for Mechanical Testing of Steel Products.
- b. Frequency: Tensile tests shall be made at the frequency of one pile per each pile size.
- c. Longitudinal Tensile Tests: At the option of the manufacturer, longitudinal tests may utilize a full specimen, or for pipe with a wall thickness greater than $\frac{3}{4}$ in., a $\frac{1}{2}$ in. diameter round bar specimen. The strip specimen shall be tested without flattening.
- d. Transverse Tensile Tests: The transverse tensile properties shall be determined as follows: The yield strength, ultimate strength and elongation values shall be determined on a flattened rectangular specimen. The same method of testing shall be employed for all lots for a given pile diameter and wall thickness. All specimens shall represent the full wall thickness of the pipe from which the specimen was cut.
- e. Weld Tensile (Reduced Section Tension) Tests: The weld tensile test specimens shall be taken at 45 degrees to the weld with the weld at the center, and shall represent the full wall thickness of the pipe from which the specimen was cut. Weld reinforcement shall not be removed unless directed by Owner's Representative.

2. Guided – Bend Tests:

- a. Test Specimens: The test specimens shall be taken from the spiral welded pipe of each combination of outside diameter and wall thickness containing skelp weld ends. The specimens shall not contain repair welds. Tests shall be in accordance with AWS D1.1, Clause 4. One test per each pile size.

- b. Charpy V-Notch shall be performed conforming to the requirements of the API 5L.

H. Pile Installation Observation: Pile installation shall be performed under the continuous observation of a Geotechnical Engineer licensed as a PE in the State of California to confirm that the driving and coring conditions are similar to those expected based on the soil conditions used in the pile design.

1.8 PRODUCT HANDLING

- A. Use all means necessary to protect steel piles before, during, and after installation and to protect the installed work and materials of all other trades.
- B. In the event of damage, immediately make all repairs and replacement necessary and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Pipe Piles

1. All steel pipe pile material used for float offshore guide piles must be:
 - a. ASTM A252 Grade 3 modified to 52 ksi or engineer approved equivalent
2. All steel pipe pile material used for float onshore guide piles must be:
 - a. ASTM A252 Grade 3 or engineer approved equivalent
3. All steel pipe material used for the landing platform must be:
 - a. ASTM A252 Grade 3 modified to 50 ksi or engineer approved equivalent
4. Pipe sections shall be marked with material type prior to installation.
5. Provide mill certificates for pipe pile materials.

B. Pile Cover Cones: Fiberglass.

2.2 FABRICATION

A. STEEL PIPE PILES

1. Pipe piles may be manufactured with longitudinal seam or helical (spiral) seam.

Fabricator of steel pipe shall be certified by the Steel Plate Fabricator's Association (SPFA) when plates are used to fabricate pipe. Pipe piles shall be fabricated in accordance with one of the following standards (neglecting any requirements that welds be longitudinal), and the additional requirements in this specification:

- i. API 5L PSL 1 or PSL2 (hydrostatic testing not required)
 - ii. ASTM A252 with geometry meeting API requirements
2. Welding shall be performed in accordance with the requirements in Contract Specification Section 05 12 00 – STRUCTURAL STEEL FRAMING.
 3. At the float guide piles, spiral, longitudinal, and butt welds above Mean Lower Low Water must be ground flush with the pile face. At the donut fender piles, spiral, longitudinal, and butt welds from 9'-6" below Mean Lower Low Water to the pile top must be ground flush with the pile face.
 4. Fabrication Tolerances:
 - a. Overall length +/- 3 inches;
 - b. Deviation from a straight line shall not exceed 0.1 percent along the entire length of pile.

B. PILE SPLICES

1. No more than two (2) shop splices shall occur in any 40 ft. length of pile. Splices shall be at least 10 ft. apart. Exception: non-spirally welded pipe piles with 1 1/4" or thicker wall may be fabricated with circumferential splices spaced no closer than 7'-0" so long as the longitudinal seams are staggered and the circumferential and longitudinal welds are double-sided with no backing material left in place, such that the welds conform to Type 6.4 or 6.5 of Table 6 in BS 7608:2014.
2. No more than one (1) field splice may be made in each pile. Any field splice in a guide or donut fender pile must be located below elevation -42' MLLW. Any field splice in a fixed pier pile must be located below elevation -19' MLLW.
3. Splice welds shall be complete joint penetration groove welds using AWS D1.1 prequalified joint details and shall be ultrasonically tested in accordance with the requirements of AWS D1.1 Table 6.3.
4. Weld Bead Height: The weld bead height shall not be greater than 3/16 inch typically and shall be ground flush with outer wall per paragraph 2.2 within portion of length bearing with UHMW elements of donut fender piles and float guide piles. Refer to the drawings.

5. Misalignment: Misalignment of the weld beads shall not exceed 1/8 inch. This applies only to double-sided welded pipe.

2.3 PILE MARKING

- A. Mark piling with lines at one-foot intervals from tip to top. Number every 5 ft. increment. Marking should be neat in appearance.
- B. Markings shall be done with high visibility paint and be clearly visible and legible to the naked eye at a distance of 75 ft.
- C. Paint markings on coated pile sections shall be of material approved by the coating manufacturer.
- D. Piles not properly marked will be rejected

2.4 PILE COATING SYSTEM

- A. Landing Pile Platform pile shall have the following coatings or engineer approved equivalent.
 1. 1st Coat (full length) – Apply one coat PPG Amercoat 235 (white) @ 8 mils minimum D.F.T.
 2. 2nd Coat (full length) – Apply one coat PPG Amercoat 235 (haze gray) @ 8 mils minimum D.F.T.
 3. 3rd Coat (top 25' non-immersed end) – Apply one coat PPG Amercoat 235 (pearl gray) @ 2 mils minimum D.F.T.
- B. All coating damaged during handling shall be repaired in accordance with coating manufacturer's recommendations, at Contractor's expense.

PART 3 - EXECUTION

3.1 PILE INSTALLATION PROCEDURE

- A. All work shall be performed using marine equipment including a floating crane, pile installation equipment, and other associated barges and facilities.
- B. Use equipment that is generally used in standard pile installation practice.
- C. All pile driving shall be conducted in compliance with noise and vibration thresholds defined for specific geographic areas and with the monitoring requirements stated in the permits.
- D. The size or capacity of hammers must be as recommended by the

hammer manufacturer.

- E. Operate at manufacturer's recommended speeds and pressures.
- F. Use fixed leads or other suitable means for holding pile firmly in position.
- G. Install piles with equipment of the same model and manufacturer, same energy and efficiency, and using the same installation system detailed in the approved Pile Installation Plan.
- H. The Contractor shall provide facilities as required to assist inspection of driven piles and cooperate with inspection personnel to expedite work.
- I. The Construction Drawings shall indicate the minimum penetration or maximum pile tip elevation, and the estimated pipe pile length. Estimated pile lengths are approximate. Tip elevations may need to be adjusted based on driving observations. The Geotechnical Engineer observing the pile driving shall advise.

3.2 INSTALLATION

- A. Pile locations shall be laid out by the Contractor in accordance with the Construction Drawings and approved Shop Drawings. All piles shall be installed in their design location, alignment both laterally and longitudinally, and with the specified tip elevation.
- B. Notify Owner 30 days prior to the date pile installation is to begin. Notify the Owner at least 48 hours prior to pile driving.
- C. Pile lengths may be adjusted prior to driving by either cutting the pile to a reduced length or extending the pile to an increased length with a spliced segment. Either action must be performed at the tip end of the pile. The tip ends of the piles shall be shop cut-off or spliced if the pile length requires adjustment.
- D. Note that in-water work is permitted to the work window and conditions described in project permits.
- E. Once pile installation has begun, keep conditions such as alignment constant. Install each pile continuously and without interruption until the required tip elevation has been attained.
- F. The Contractor shall survey the final location of the driven piles (after cut-off) on a weekly basis, update the Shop Drawings as required and provide the information to the Owner. Take special precautions to ensure against buckling of pile or leaning away from plumb position.
- G. Care should be taken during installation to prevent and correct any tendency of piles to deviate or walk.

3.5 PILE CUTOFF

- A. The Contractor shall provide a 2-ft sacrificial length at the top of the pile to allow for damaged pile cut-off and to accurately implement the required cut-off elevations.
- B. Any damage to coatings due to pile installation or cutting shall be repaired.

3.6 DAMAGED PILES

- A. Do not install piles damaged or suspected of damage until inspected and approved by the Owner.
- B. Pile damaged or impaired for use during driving shall be pulled and replaced with new piles as directed by the Owner.
- C. The Owner may require that any pile suspected of being damaged to be pulled for inspection.
- D. Replace piles pulled as directed and found to be damaged with new piles at the Contractor's expense.
- E. All repair costs for pile and coating including additional materials and labor required, shall be at the Contractor's expense.

3.7 PILE INSTALLATION RECORDS

- A. The Owner shall maintain a pile installation log showing the following:
 - 1. All piles shall be referenced per the numbering system shown on Contractor's Shop Drawings.
 - 2. Record all pile lengths as furnished and the length of pile in place. Include elevations of tip and butt before and after cutting off and tip elevation.
 - 3. Provide as-driven survey drawing showing actual location (coordinates, elevations, and plumbness) of all piles. This shall be a drawing prepared for this record (i.e., not a copy of the Construction Drawings).
 - 4. Record the pile penetration and the rate of penetration.
 - 5. Include in the record the type and size of hammer and drill used. Record any unusual occurrence during pile installation.

END OF SECTION