

Addendum Date: February 17, 2023

CITY OF PENSACOLA, FLORIDA
ADDENDUM #1

BERTH 6 REHABILITATION PROJECT

BID NO: 23-013

The following items take precedence over the documents for the above named item. All other terms and conditions shall remain the same.

**A SIGNED COPY OF THIS ADDENDUM MUST BE RETURNED
WITH YOUR SUBMITTAL AS ACKNOWLEDGEMENT.**

Company: _____

Date: _____

Authorized:

Representative: _____

Title: _____

Printed Name

Signature: _____

1. The following drawings have been revised.
 - a. Drawing G2 - Project General Notes and Drawing Index, Rev B
 - b. Drawing S1 – Structural General Notes, Rev. B
 - c. Drawing S10 - Pile Repair Details & Notes, Rev. B
2. Specification 03640 - Fiber Reinforced Polymer (FRP) Laminate Pile Repairs has been deleted.
3. Specification 13120 – Galvanic Cathodic Protection Jacket System has been added.
4. Listed below are questions received from potential bidders with responses indicated in red:
 - a. The Instructions to Bidders requires that the project be complete and ready for final acceptance by 300 calendar days from the commencement date set by the City of Pensacola. There are long lead delivery items such as new 400 amp breakers for the existing Switch Gear, 400 amp safety switches and 400 amp shore power receptacles. Specialty electrical equipment above 200 amps currently has a delivery time, from the date of approval and release for fabrication, of up to 52 weeks. When you add the procurement and submittal review time, 60 days minimum, and installation

time after receipt at the jobsite it will take more than 425 days to complete these features of work so that the downstream electrical systems can be energized. Other long lead delivery items that we are aware of, in this project, are the specialty castings for the CP test stations, splice boxes and Handholes; as well as 75 Metric Ton cast steel bollards that could negatively impact the completion time for the project. The embedded castings may delay Phase 1 completion. Please consider increasing the project completion time to 450 days to allow for the delivery of the long lead items in this project.

It is understood that the electrical equipment may have long lead times which may require the project to extend longer than 300 days. A no cost time extension will be considered on an individual basis due to long lead items.

- b. General Conditions Section 4, Paragraph 5.9 Inspection Facilities requires that “The Contractor shall provide and shall maintain, unless otherwise specified, suitable, and adequate facilities at the site of the project for the use of those representatives or agents of the City assigned to the project until the completion of this Contract.” Please quantify the temporary facility space, furnishings, equipment and utilities, such as telephone and internet services, that the contractor should anticipate providing for the owner’s use.

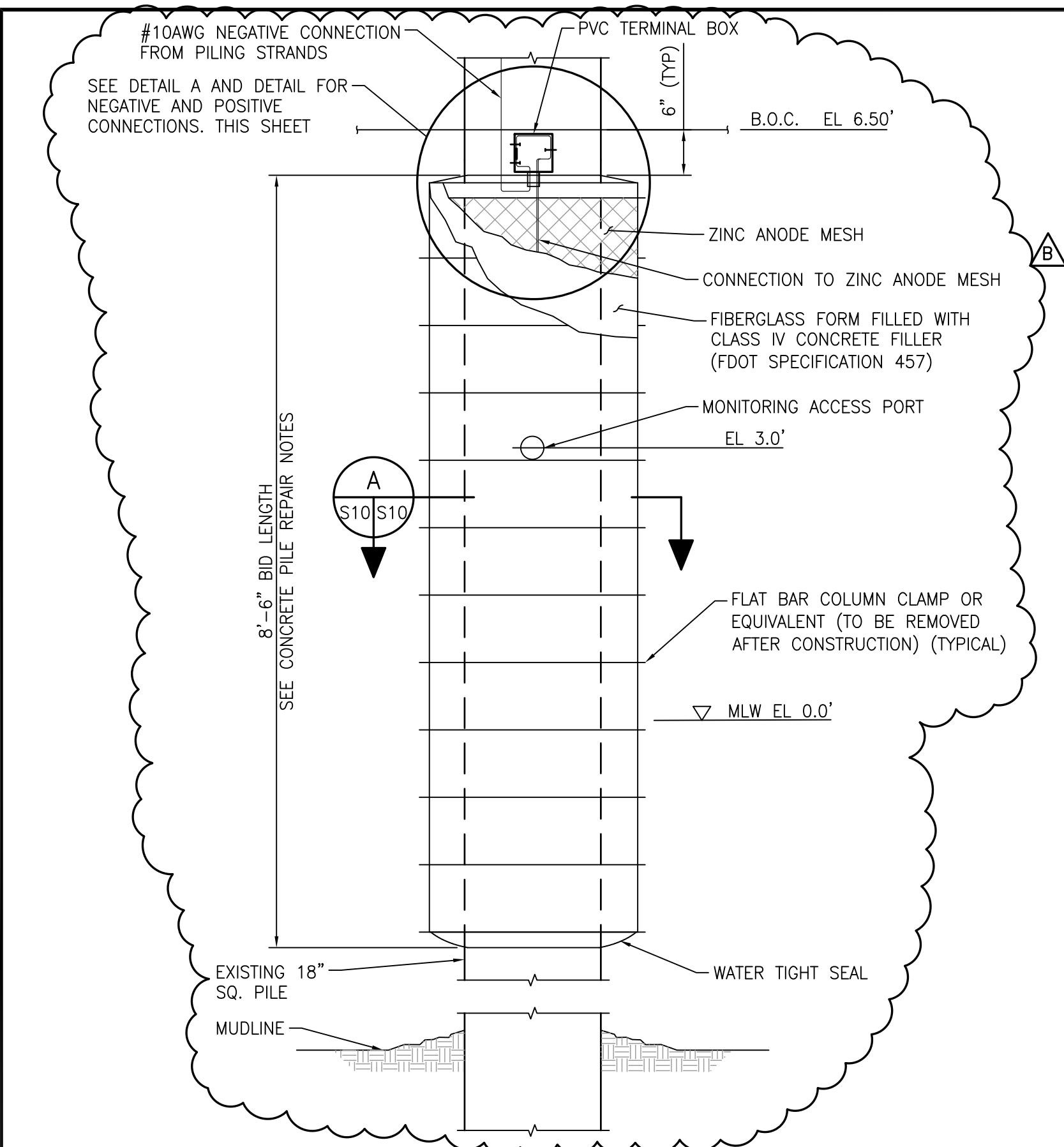
The Contractor will not be required to provide any facilities for the representatives or agents of the City assigned to the project.

- c. Specification for Seawall Waterside CP System; Section 131100; Rev. A requires that. “The supervisor must be on job site at all times while all construction/installation work is being performed.” Please confirm that this applies only to the time that the Cathodic Protection system is being installed and not for the entire construction period.

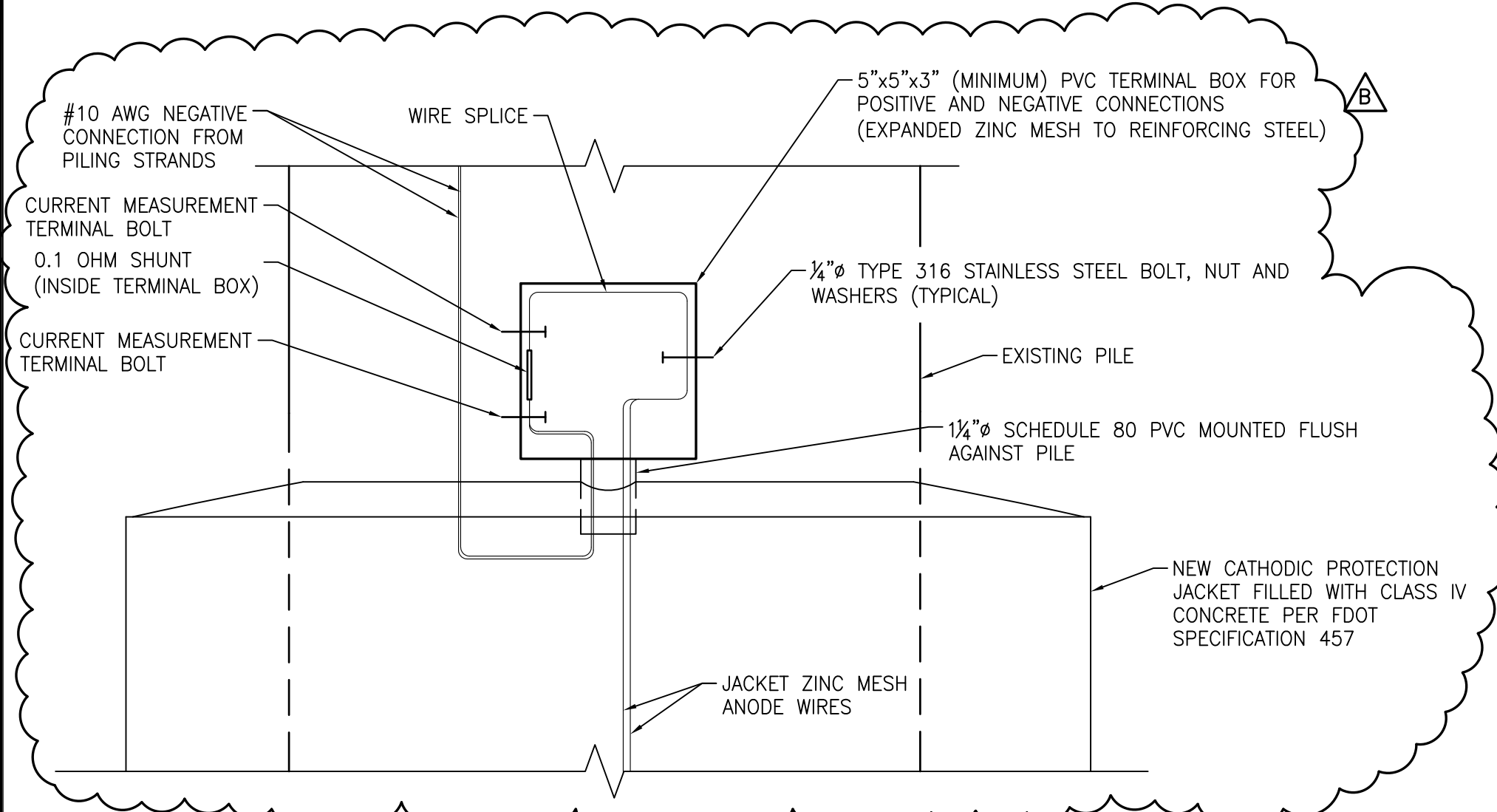
Correct. The cathodic protection supervisor is to be on site for all cathodic protection work being performed.

- d. Berth 6 Rehabilitation Project drawing S26 detail A calls for “EXISTING SUBGRADE COMPACTED TO 95% MODIFIED PROCTOR (ASTM D1557)” to a depth of 7’4” adjacent to the new compacted subgrade placed with an approximate 1:1 slope. Please advise if this is intended to advise the contractor that the existing subgrade is already properly compacted or if the contractor is to bench the existing subgrade and test the compaction of the existing subgrade. Further, if the existing subgrade does not meet the required compaction, please advise what steps the contractor is to take to correct the compaction of the existing.

The disturbed existing subgrade shall be compacted as stated prior to installation of the new subgrade. Benching is not necessary.

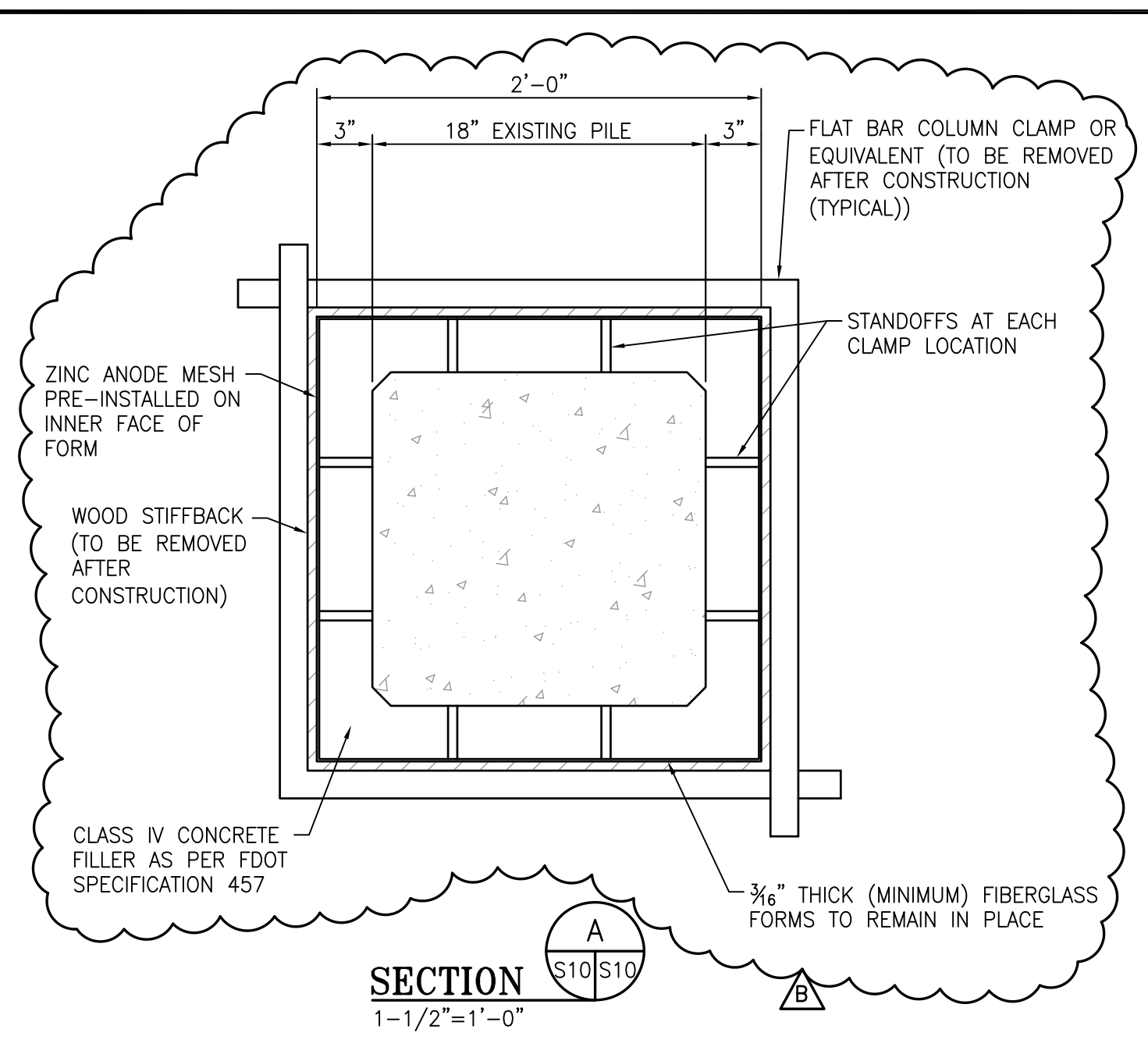


CONCRETE PILE REPAIR DETAIL
3/4"=1'-0"



DETAIL-A
N.T.S.

- NOTES**
- ALL PILE REPAIR WORK TO BE PERFORMED AFTER THE REMOVAL OF THE EXISTING CONCRETE DECK ABOVE. NO PILE REPAIR WORK OR INSPECTIONS SHALL BE PERFORMED UNDERNEATH THE EXISTING DOCK PRIOR TO THE REMOVAL OF THE EXISTING DECK AND BEAMS.
 - COORDINATE PILE REPAIR WITH CATHODIC PROTECTION REQUIREMENTS.



SECTION
1-1/2"=1'-0"

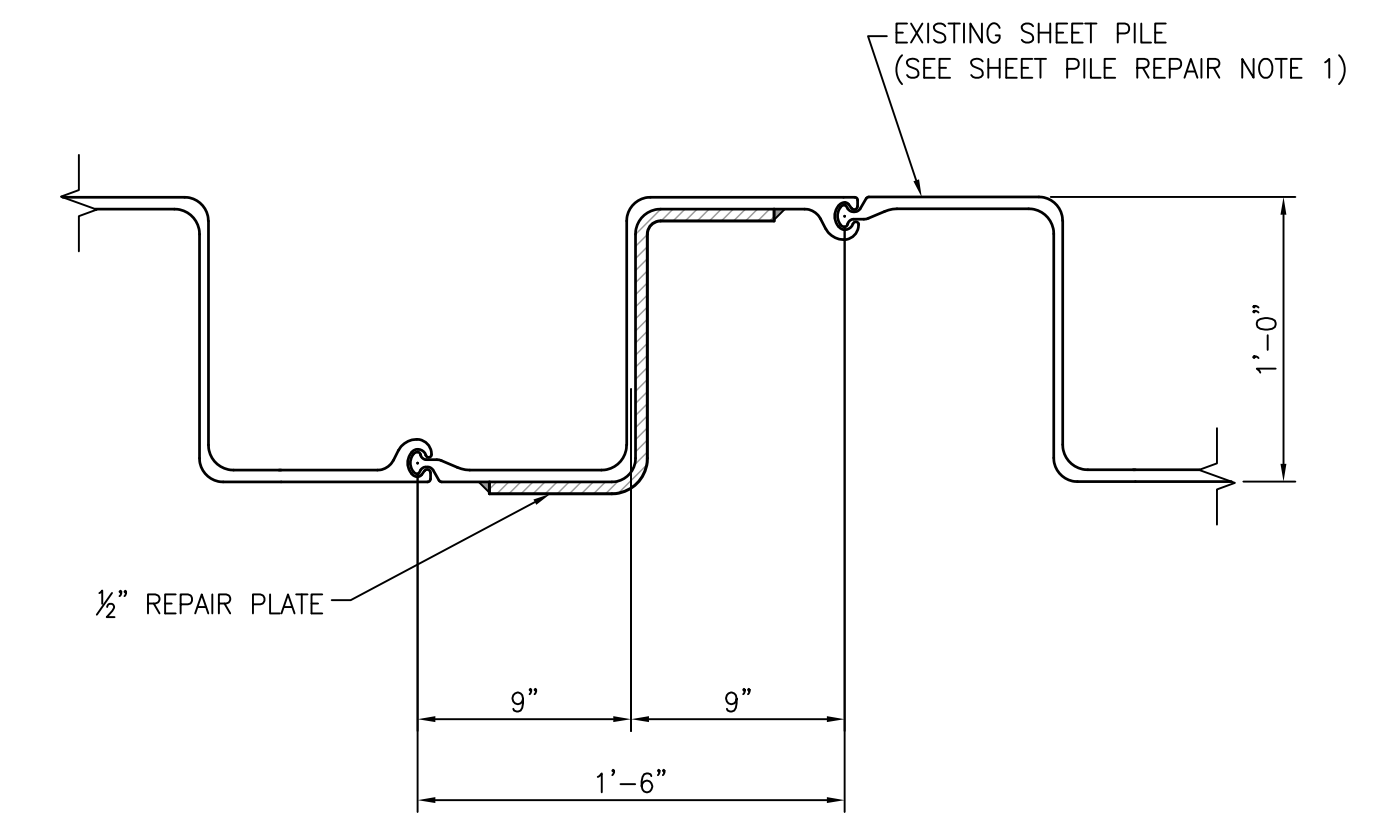
CONCRETE PILE REPAIR NOTES:

- PILE REPAIR SYSTEM SHALL BE A CATHODIC PROTECTION STRUCTURAL INTEGRAL PILE JACKET SUCH AS LIFEJACKET ANODE SYSTEM MANUFACTURED BY STRUCTURAL TECHNOLOGIES OR ENGINEER APPROVED EQUAL. SEE PROJECT SPECIFICATION 13120 GALVANIC CATHODIC PROTECTION JACKET SYSTEM. SUBSTITUTION OF REPAIR SYSTEM SHALL BE ENGINEER APPROVED PRIOR TO BID.
**FRANK DRESSMAN
STRUCTURAL TECHNOLOGIES
PH. (619) 964-1006**
- CONSTRUCTION INSPECTION DIVER:** CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING, LOCATING, AND DETERMINING THE ACTUAL LENGTH OF ALL PILE DAMAGE FOR ALL EXISTING PILES. IF PILE DAMAGE IS FOUND TO BE DIFFERENT FROM THAT IDENTIFIED ON THE DRAWINGS, ENGINEER SHALL BE NOTIFIED.
- CONTRACTOR WILL PROVIDE INDEPENDENT DIVER TO MAKE **QUALITY ASSURANCE (QA) INSPECTIONS** FOR EACH PILE REPAIR.
 - A. PILE LOCATION
 - B. LENGTH OF DAMAGE
 - C. CLEANING OF PILE
 - D. INSPECTION OF REPAIR
 - E. THE INDEPENDENT DIVER PERFORMING QA INSPECTIONS SHALL BE DIFFERENT DIVER FROM CONSTRUCTION INSPECTION DIVER.
 - F. THE INDEPENDENT DIVER SHALL BE UNAFFILIATED WITH CONTRACTOR OR SUB-CONTRACTOR AND SHALL BE NAMED IN THE CONTRACTOR'S BID.
- CONTRACTOR'S BID PACKAGE SHALL INCLUDE DOCUMENTATION SHOWING CONTRACTOR OR HIS SUB-CONTRACTOR (WHOEVER IS PERFORMING REPAIRS) HAS PERFORMED A MINIMUM OF 5 SIMILAR PROJECTS USING THESE MATERIALS AND TECHNIQUES; PROVIDE LIST OF PROJECTS, LOCATION, OWNER, CONTRACT AMOUNT, CONTACT PERSON, AND TELEPHONE NUMBER. ALSO, INCLUDE STATEMENT THAT THE CONTRACTOR OR HIS SUB-CONTRACTOR (WHOEVER IS PERFORMING THE REPAIRS) HAS BEEN IN THIS BUSINESS FOR A MINIMUM OF 5 YEARS.

CONCRETE PILE REPAIR SCHEDULE

| BENT NO. | PILE ROW | EXISTING CONCRETE PILE SIZE | JACKET LENGTH * (EACH PILE) |
|------------------|----------|-----------------------------|-----------------------------|
| 1 | B, C & F | 18" SQ. | 8'-6" |
| 3 | B & C | 18" SQ. | 8'-6" |
| 4 | B & C | 18" SQ. | 8'-6" |
| 5 | B, C & D | 18" SQ. | 8'-6" |
| 6 | B | 18" SQ. | 8'-6" |
| 8 | B | 18" SQ. | 8'-6" |
| 9 | D & F | 18" SQ. | 8'-6" |
| 10 | C & E | 18" SQ. | 8'-6" |
| 11 | D | 18" SQ. | 8'-6" |
| 12 | B & C | 18" SQ. | 8'-6" |
| 18 | C | 18" SQ. | 8'-6" |
| 19 | B | 18" SQ. | 8'-6" |
| 20 | B | 18" SQ. | 8'-6" |
| 30 | F | 18" SQ. | 8'-6" |
| 38 | F | 18" SQ. | 8'-6" |
| 40 | F | 18" SQ. | 8'-6" |
| 50 | F | 18" SQ. | 8'-6" |
| 51 | B | 18" SQ. | 8'-6" |
| 52 | B | 18" SQ. | 8'-6" |
| 54 | B, E & F | 18" SQ. | 8'-6" |
| 56 | B | 18" SQ. | 8'-6" |
| 57 | C & F | 18" SQ. | 8'-6" |
| 58 | E | 18" SQ. | 8'-6" |
| TOTAL BID LENGTH | | | 297'-6" |

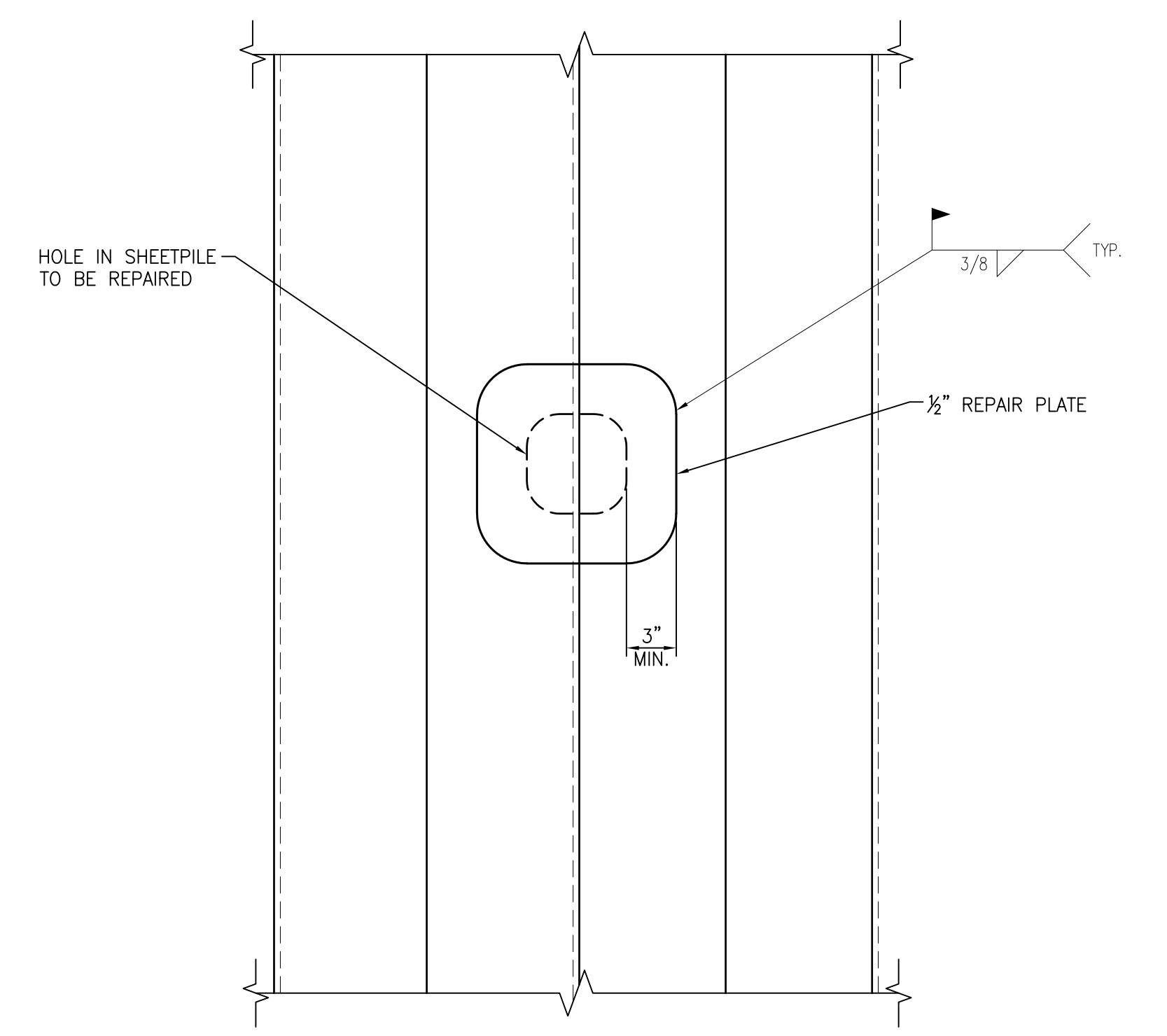
* JACKET LENGTH FOR BID PURPOSES ONLY. ACTUAL REPAIR LENGTH TO BE DETERMINED FROM CONSTRUCTION INSPECTION DIVE REPORT.



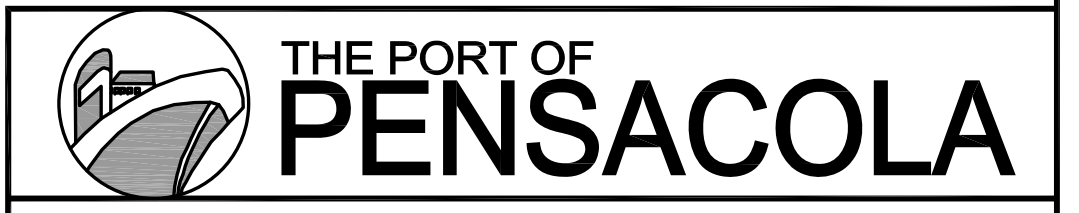
SHEET PILE DETAIL
1-1/2"=1'-0"

SHEETPILE REPAIR NOTES:

- SHEET PILING IS USS SECTION NUMBER MZ38 OR BETHLEHEM SECTION NUMBER PZ38.
- REPAIR PLATE SHALL BE ASTM A572 MATERIAL AND SHALL COVER A MIN. OF 3" BEYOND PERIMETER OF HOLE TO BE REPAIRED. HOLE LOCATION, QUANTITIES, AND SIZES NOTED ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE CONFIRMED BY CONTRACTOR'S CONSTRUCTION INSPECTION DIVER.
- ALL STEEL SHEET PILE SHALL BE CLEANED USING HIGH PRESSURE WATER JETTING PER SSPC SP-12. THE PURPOSE OF THIS PREPARATION IS TO REMOVE ALL MARINE GROWTH AND ANY SOFT SURFACE LAYER THAT MAY HAVE ACCUMULATED ON THE SHEET PILES.
- THE ELAPSED TIME BETWEEN THE CLEANING OF A STEEL SHEET PILE AND THE INSTALLATION OF THE REPAIR ON THAT STEEL SHEET PILE SHALL NOT EXCEED 72 HOURS. IF THIS TIME FRAME IS EXCEEDED CONTRACTOR SHALL RE-CLEAN THE SHEET PILE PRIOR TO REPAIR.
- IRRESPECTIVE OF THE ABOVE, CONTRACTOR SHALL REMOVE ANY MARINE GROWTH THAT HAS ACCUMULATED ON THE STEEL SHEET PILE PRIOR TO THE REPAIR.
- CONSTRUCTION INSPECTION DIVER:** CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING, LOCATING, AND DETERMINING THE ACTUAL SIZE OF ALL HOLES IN EXISTING SHEET PILE WALL. IF DAMAGE IS FOUND TO BE DIFFERENT FROM THAT IDENTIFIED ON THE DRAWINGS, ENGINEER SHALL BE NOTIFIED.
- CONTRACTOR WILL PROVIDE INDEPENDENT DIVER TO MAKE **QUALITY ASSURANCE INSPECTIONS** FOR EACH PILE REPAIR.
 - A. HOLE LOCATION
 - B. SIZE OF HOLE
 - C. CLEANING OF SHEET PILE AROUND HOLE
 - D. INSPECTION OF REPAIR
 - E. THE INDEPENDENT DIVER PERFORMING QA INSPECTIONS SHALL BE DIFFERENT DIVER FROM CONSTRUCTION INSPECTION DIVER.
 - F. THE INDEPENDENT DIVER SHALL BE UNAFFILIATED WITH CONTRACTOR OR SUB-CONTRACTOR AND SHALL BE NAMED IN THE CONTRACTOR'S BID.



SHEET PILE REPAIR ELEVATION
1-1/2"=1'-0"



| | | | |
|------------------|-------------|--------------------------------|--|
| CLIENT DWG NO: | | BENTH 6 REHABILITATION PROJECT | |
| | | PILE REPAIR DETAILS & NOTES | |
| | | FOR: THE PORT OF PENSACOLA | |
| PROJECT NO: 4540 | DWG NO: S10 | REV: B | |

| NO. | REVISION | DRAWN | CK'D | APPD | DATE |
|-----|-----------------|-------|------|------|----------|
| B | REVISED FOR BID | WMB | JEJ | MED | 02/16/23 |
| A | ISSUED FOR BID | RST | JEJ | MED | 02/03/23 |

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APTIM PORT SERVICES, LLC

Port of Pensacola

Document Title: GALVANIC CATHODIC PROTECTION JACKET SYSTEM

Section No: 13120

Revision: A

Issue Date: 03-Feb-2023

**APTIM Contract No: 634025163
(M4540)**

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| Issued for Bid | A | 03-Feb-2023 | M. Dye | J. Johnson | S. Gottlieb |
| Revision Descriptions | Rev | Date | Originator | Checker | Approver |

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|--|-------------|------|
| Specification for Galvanic Cathodic Protection Jacket System | 13120 | A |

1.0 GENERAL - RELATED DOCUMENTS

- 1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2.0 SUMMARY

- 2.1 The work under this section consists of supplying, installing and energizing a sacrificial galvanic anode cathodic protection jacket system, including connection to the steel, materials, testing, and ensuring continuity between all embedded steel components on designated structural components, and all required quality control and quality assurance.
- 2.1.1 The cathodic protection jacket system consists of continuous sheets of expanded zinc mesh anodes attached directly to the inside surface of the fiberglass reinforced plastic (FRP) integral jacket.
- 2.1.2 This "System" is to be installed at the locations indicated on the plans and as directed by the Engineer of Record (EOR).
- 2.2 Minor Pile Repairs Outside Jacket Limits: The Contractor shall also restore to original dimensions minor concrete delaminations and/or spalls on the structure that may be present (above MLW line) outside the limits of the jacket, or as designated by the Engineer.

3.0 REFERENCE STANDARDS

- 3.1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- 3.2 All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- 3.3 All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references (latest editions):
- 3.3.1 American Concrete Institute (ACI):
- 3.3.1.1 ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- 3.3.1.2 ACI 301, Specifications for Structural Concrete
- 3.3.2 American Society for Testing and Materials (ASTM):
- 3.3.2.1 ASTM B69, Standard Specification for Rolled Zinc
- 3.3.2.2 ASTM B418, Standard Specification for Cast and Wrought Galvanic Zinc Anodes
- 3.3.2.3 ASTM C143, Standard Test Method for Slump of Hydraulic Cement Concrete
- 3.3.2.4 ASTM C150, Standard Specification for Portland Cement

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- 3.3.2.5 ASTM C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- 3.3.2.6 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete
- 3.3.2.7 ASTM C494, Standard Specification for Chemical Admixtures for Concrete
- 3.3.2.8 ASTM D570, Standard Test Method for Water Absorption of Plastics
- 3.3.2.9 ASTM D638, Standard Test Method for Tensile Properties of Plastics
- 3.3.2.10 ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- 3.3.2.11 ASTM D4812, Standard Test Method for Unnotched Cantilever Beam Impact Resistance of Plastics
- 3.3.2.12 ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

4.0 QUALITY ASSURANCE

- 4.1 Cathodic Protection Specialist: The Contractor shall secure the services of a Cathodic Protection Specialist accredited by NACE International or a professional engineer with a minimum of five years of experience in the field of cathodic protection on concrete. The CP Specialist, or the technician under his direction, shall supervise the overall installation including participation with the Contractor in designing the construction sequence, performing random site visits to oversee every phase of the work. Additionally, the CP Specialist, or the technician under his direction, shall be responsible for all the continuity testing, testing all the continuity corrections, and performing the initial energizing on all piles including: current, static, and energized potential measurements. The CP Specialist, or the technician under his direction, shall also check for shorts between the anode and the steel and notify the Contractor for correction as necessary prior to placing any jackets. Testing for shorts will be done before and after the filling materials are set. The CP Specialist’s NACE certification shall be submitted to the Engineer for approval.
- 4.2 Quality Control: The Contractor shall submit a quality control plan for approval prior to commencing the jacket installation. Prior to commencing any work, the Contractor shall determine the scope and sequence of work so that the appropriate measures are taken to ensure proper quality control throughout the project.
- 4.3 Certification Statement: the CP Specialist shall sign the following statement, and shall submit the original copy to the Engineer after completion of the project.
 - 4.3.1 “I hereby certify that the cathodic protection jacket systems constructed under (project number) have been completed to the point where the systems are functionally complete. I further certify that construction on these systems has preceded substantially in accordance with the contract plans and specifications or that any deviations, which are noted below, will not prevent the system from functioning in compliance with the intent of the contract when properly operated and maintained. These determinations have been based upon on-site observation of construction, scheduled and conducted by me or by a representative under

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my direct supervision, for the purpose of determining if the work proceeded in compliance with the contract documents.”

5.0 SUBMITTALS

- 5.1 Contractor’s Quality Control Plan
- 5.2 Contractor’s Debris Containment Plan
- 5.3 Contractor’s Spall Repair Log (repair quantities)
- 5.4 Shop Drawings: Prior to commencing the cathodic protection jacket installation, the Contractor shall submit for approval shop drawings indicating equipment, materials, and the procedures for installing the jacket. Include details on the following:
 - 5.4.1 Negative connections to the reinforcing steel,
 - 5.4.2 Continuity check and correction procedures,
 - 5.4.3 Mean high and low water elevations,
 - 5.4.4 Anode system fabrication, and
 - 5.4.5 Anode system positioning relative to water elevations.
- 5.5 Product Data for Jacket System:
 - 5.5.1 FRP Jacket
 - 5.5.2 Zinc mesh
 - 5.5.3 Location of standoff spacers, method of fastening jacket form to piling, method of sealing the form after assembly and method of bracing during placement of filler. Include details of access holes, caps and methods for placing the filler and sealing the pumping ports.
 - 5.5.4 Concrete fill material:
 - a. Cement and aggregate certifications
 - b. Mix design
- 5.6 Cathodic Protection Specialist qualifications
- 5.7 Cathodic Protection Specialist certification statement
- 5.8 Commissioning Report

6.0 DELIVERY, STORAGE AND HANDLING

- 6.1 Deliver, store and handle materials according to the manufacturer’s recommendations and in such a manner as to prevent damage to materials and structure.
 - 6.1.1 Store packaged materials on elevated platform and protect from weather, moisture, condensation, and neglect.

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6.1.2 Store packaged materials unopened until ready to use.

6.1.3 Zinc anodes shall be stored in dry conditions in the original unopened containers in a manner to avoid exposure to extremes of temperature and humidity.

6.2 Deliver materials to the site in the manufacturer’s original and unopened containers, clearly labeled with the manufacturer’s name and type of products.

7.0 PRODUCTS - GENERAL

7.1 The Contractor shall use only approved materials from approved sources and shall furnish material certifications to the Engineer of Record for approval prior to placing any materials. Alternative materials must meet or exceed the specified requirements and be tested by a certified, third party testing laboratory.

7.2 Material certifications must be supplied and approved before commencing any work. Materials not meeting the specifications herein will be rejected for re-submittal. The “System” must be installed according to specification and in accordance to the Manufacturer’s recommended procedures.

8.0 CATHODIC PROTECTION JACKET SYSTEM

8.1 The jacket “System” shall consist of stay-in-place fiberglass forms provided with a zinc mesh anode pre-installed against the inside surface in a continuous expanded metal sheet and filled with an approved sand-cement mortar or structural concrete (5500 psi minimum).

8.1.1 **Fiberglass Forms:** Use forms composed of a durable, inert, corrosion resistant material with an interlocking joint along one or two sides that permits the form to be assembled and sealed in place around the pile. Fabricate the forms from glass or carbon fibers and polyester or vinyl ester resins. Ensure the form is capable of maintaining its original shape without additional support or damage when placed around a pile. The inside-face of the form shall have no bond inhibiting agents in contact with the filler material or mesh anode. The forms shall be provided with nonmetallic bolt stand-offs which will maintain the forms in the required position. Sandblast or score the inside surface of the forms with an abrasive material to provide a rough surface texture and ensure bond with the filler material. Use non-metallic hardware for pumping ports when these are provided. Assembly and jacket preparation shall be completed at the factory before delivery to the job site. The forms shall be properly sealed in the field to provide a positive seal of the annular space between the concrete component and the form.

8.1.1.1 **Form Material:** The material furnished for the FRP jacket forms must meet the following physical property requirements:

- 1) Water Absorption (ASTM D570) – 1% max.
- 2) Ultimate Tensile Strength (ASTM D638)* - 15,000 psi min.
- 3) Flexural Strength (ASTM D790)* - 25,000 psi min.
- 4) Flexural Modulus of Elasticity (ASTM D790) – 700 ksi min.
- 5) IZOD Impact (ASTM D4812) – 15 ft-lb/inch min. (unnotched)

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6) Barcol Hardness (ASTM D2583) – 45 min.

* On original specimen whose flat surfaces are not machined to disturb fiberglass.

8.1.1.2 Fiberglass thickness: minimum wall thickness shall be 3/16 inch.

8.2 Zinc Mesh Anode: The zinc mesh anode attached inside the jacket shall be continuous sheets of expanded zinc mesh placed in direct contact with the face of the fiberglass jacket and conforming to special A-190 zinc alloy and certified in accordance with ASTM B 69.

8.2.1 The zinc mesh must be tested and meet the following chemical composition (chemical analysis to be provided with the material submittals).

- 8.2.1.1 Pb 0.003% wt. max.
- 8.2.1.2 Fe 0.001% wt. max.
- 8.2.1.3 Cd 0.001% wt. max.
- 8.2.1.4 Al 0.001% wt. max.
- 8.2.1.5 Ti 0.001% wt. max
- 8.2.1.6 Cu 0.7 - 0.9% wt. range
- 8.2.1.7 Mg 0.0005% wt. max
- 8.2.1.8 Mn 0.001% wt. max
- 8.2.1.9 Ni 0.001% wt. max
- 8.2.1.10 Sn 0.001% wt. max
- 8.2.1.11 Zn balance

8.2.2 Additionally, the mesh anode shall have the following physical properties:

- 8.2.2.1 Electrical conductivity = 28% min.
- 8.2.2.2 Solid zinc density = 0.28 lb / cu. in.
- 8.2.2.3 Weight of expanded zinc mesh = 1.60 lb/ sq. ft. min.
- 8.2.2.4 Average open area = 53%
- 8.2.2.5 Solid sheet thickness = 0.90 inch

8.2.3 The expanded zinc mesh anode shall also conform to the following nominal geometry to allow proper filler encapsulation:

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- 8.2.3.1 0.500 inch hex pattern
- 8.2.3.2 0.125 inch strand width SWD
- 8.2.3.3 0.563 inch strand bond width LWD
- 8.2.3.4 0.313 inch short opening
- 8.2.3.5 0.750 inch long opening

8.3 Connection Wires: The expanded mesh anode shall be provided with a thermally fused connection wire for each jacket section and be long enough to make the appropriate connections for the system operation. Connection wires shall either be directly wired to the steel reinforcement within the jacket area, or be routed to a terminal junction box mounted outside the jacket limits and as determined by the EOR.

8.4 Fill Material

8.4.1 The concrete fill material shall be a Portland Cement concrete filler. Use Class IV Concrete meeting the requirements of FDOT Section 346 with an adjusted slump of 7 to 9 inches. The mix shall not contain fly ash, slag, silica fume or corrosion inhibiting admixtures.

8.4.2.1 Sample and test the Class IV Concrete as required in FDOT Section 346. Conduct test at a frequency of one set of tests per LOT. The maximum LOT size is 50 CY or one day's production, whichever is less.

8.4.2.2 Total amount of chlorides for fillers shall not exceed 0.4 pounds per cubic yard of filler after placement.

8.5 Terminal Box: The terminal box shall measure 5 inch by 5 inch by 4 inch minimum, or other suitable size with weather tight cover and shall be attached to the mounting surface using a minimum of four fasteners.

8.5.1 All PVC components shall be Schedule 80, UV resistant.

8.5.2 All hardware for installation of the PVC conduit and terminal box shall be Type 316 stainless steel.

8.5.3 A 0.1-ohm shunt shall be placed inside the terminal box and wires for measuring the current shall be routed to two, ¼ inch diameter stainless steel bolts that shall extend outside the terminal box.

9.0 EXECUTION – GENERAL

9.1 The Contractor shall be responsible for the repair or replacement of any damaged private or public property resulting from his/her operation. Any testing required to assign responsibility of damage shall be secured by the Contractor at no cost to the Owner.

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10.0 PREPARATION

- 10.1 Inspection: The Contractor shall inspect all concrete components and clearly mark deteriorated areas; including hollow sounded areas that are to receive the jacket “System”. All areas shall be sound tested by the Contractor to determine the actual dimensions of the deteriorated concrete to be removed. Each jacket should encompass the entire problem area within the specified jacket limits. The Engineer reserves the right to modify the jacket system to address confined areas, or areas inaccessible for normal jacket installation. Dimensions of the spalled areas shall be recorded by the Contractor and verified by the Engineer. A final report detailing locations and size of the spalls and/or cracks shall be provided by the Contractor at the end of the project. Remove all delaminated, cracked or unsound concrete from the areas, which are hollow sounding when tested, or areas with visible cracks (up to 0.015 inch wide) may not need to be removed as directed by the Engineer.
- 10.2 Jacket Location and Limits: The jacket “System” shall be installed on the designated concrete components starting and terminating at the elevations detailed in the construction plans. Adjustments to these elevations may be required to encompass areas that may have obstructions, or other requirements to achieve adequate protection and repair. The Contractor shall field verify all jacket requirements prior to placing any orders.

11.0 INSTALLATION

- 11.1 Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- 11.2 All installation shall be in accordance with manufacturer’s published recommendations.
- 11.3 Concrete Surface and Reinforcement Preparation: Surface preparation shall include the removal of all loose or delaminated concrete. Limit the size of chipping hammers to 20 pounds unless otherwise approved by the Engineer. Thoroughly clean all pile surfaces that the jackets will cover. Remove all oil, grease, dirt, broken concrete, marine growth and any other deleterious material that could prevent proper bonding. All exposed reinforcing shall be cleaned to SSPC-SP10, near white, per the Society of Protective Coatings to remove all rust and scale before installation of the pile jacket. Water blast or mechanically clean reinforcing steel exposed under water by methods and with equipment approved by Engineer. Do not place the form until the surface preparation has been approved by the Engineer. All reinforcing steel shall be maintained at original position. Exposed reinforcing bars or pre-stressing strands shall not be left unprotected for a period greater than 72 hours. Cleaned pile surfaces shall be washed down with fresh (non-saline) water immediately prior to placement of pile jacket filler material.
- 11.4 Concrete Removal: Spalled concrete removal and clean-up is considered incidental to the jacket installation. Care shall be exercised as to contain falling debris from entering into the water. Debris includes but is not limited to scrap metal, demolition debris, concrete and concrete dust, zinc, etc. A containment plan shall be submitted by the Contractor for approval by the Engineer prior to commencing any work.
- 11.5 Continuity: Continuity of reinforcement including prestressing steel, reinforcing bars, dowel bars, and spiral ties, shall be provided by resistance welding or other approved method. This is accomplished by joining two separate solid, mild steel wires to all discontinuous steel elements until the complete steel matrix is continuous with itself. The Contractor shall submit details of the intended method for this operation and materials specifications for approval by the Engineer.

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- 11.5.1 Prior to installing the jacket, the CP Specialist or technician, shall perform an electrical continuity test between all strands, spiral ties, and dowel bars (if present) on all concrete components receiving cathodic protection. The CP Specialist shall certify such tests correct and a detailed report shall be provided to the Engineer at the end of the project.
- 11.5.2 Repair any discontinuous steel at no extra cost. Provide continuity by resistance welding two continuous solid steel wires to each strand requiring continuity correction inside the excavation. Re-test continuity on all strands after this operation is completed. All welds shall be approved satisfactory by the Engineer, appointed inspector or CP Specialist before coating with epoxy. Continuity welds shall receive a coat of 100% solids, non-conductive epoxy such that no welded wire shall be in contact with the concrete when patching. Intended resistance welding equipment and procedure shall be included and submitted for approval in the shop drawings prior to performing this work.
- 11.5.3 After connection is approved, the excavation shall be filled with an approved filler prior to the jacket installation.
- 11.6 Negative Connections (to steel reinforcement): The Contractor shall install an electrical negative connection on each concrete element receiving cathodic protection. This location shall be maintained constant at locations unless otherwise approved by the Engineer and the CP Specialist. Connections shall be one of the following methods:
 - 11.6.1 The connection shall be performed by brazing two No. 10 AWG THWN copper strand wires to different areas of the steel reinforcement at the elevation shown in the construction drawings. A sufficient length of wire shall be used such that the wires can be routed to the terminal box mounted on the pile without any splices. The wire shall be brazed to a minimum length of the spiral tie of 1 inch. The brazed part of the negative connection wire (at the spiral ties) shall receive a coat of 100% solids, non-conductive epoxy such that no wire or brazing material will be in contact with the concrete when patching.
 - 11.6.2 Soldered electrical ring connectors shall be used for the connection. Connection between the ring connectors shall be made using 316 stainless steel bolts, nuts and washers. The connection shall be properly insulated after completion. Wire splices and connections insulating method and materials shall be submitted to the Engineer for approval prior to performing this work.
 - 11.6.3 Alternate method submitted and approved by CP Specialist and Engineer.
- 11.7 Terminal Box: The terminal box shall be placed at a convenient location for testing and in an area less likely to see damage. The elevation of the terminal box shall be maintained constant throughout the project where possible for similar elements.
- 11.8 Forms: Jackets shall be equipped with staged pumping ports at specific locations to assure good concrete placement and provide a void-free fill annulus.
 - 11.8.1 All joints need to be sealed for a grout-tight seal prior to placing any of the fill material.
 - 11.8.2 Upon placing the forms around the concrete components; they should be grout-tight and capable of maintaining their shape without assistance or damage. Jacket stand-offs may require field fabrication after removal of unsound concrete to assure proper alignment of the jacket during fill material placement.

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11.8.3 Seal bottom of form against the clean pile surface with the compressible seal, can coat the seal with an APL listed epoxy mastic suitable for underwater application.

11.9 Placement: Pile surfaces shall be washed down with fresh (non-saline) water immediately prior to placing the filler material. The filler material shall be placed in one continuous pour at no more than 72 hours after final surface preparation. Do not drop filler material into forms higher than five feet or into forms containing water. Filling material for jackets extending below water level shall be pumped from the bottom upward using the staged pumping ports. The pumping process shall continue after initial filling until no water is present at the highest discharge point of the jacket and a uniform grout consistency is achieved. Provide internal or external vibration to ensure proper consolidation.

11.10 Curing: After the filling material has cured for a minimum 72 hours, all temporary form support and/or bracing shall be removed from the FRP jackets and the exterior of the jackets shall be cleaned of any filling material which may have been deposited.

12.0 COMMISSIONING

12.1 Commissioning the System: The CP Specialist shall submit a report to the Engineer detailing: continuity testing and correction, anode to steel resistance, initial current, and static and energized on and off potentials for each test station on the concrete components being protected. The commissioning report and the Contractor's spall size log shall be submitted to the Engineer at the completion of the project.

END OF SECTION