

**Maine Maritime Academy
Castine, Maine**

**Pier Upgrades and Waterfront Improvements Project
March 29, 2024
ADDENDUM NO. 7**

Prospective bidders and all concerned are hereby advised of the following changes/modifications in the Maine Maritime Academy Waterfront Campus Pier Upgrades and Waterfront Improvements Issued-for-Bidding Drawings and Project Manual dated January 26, 2024 and are hereby requested to change their copies accordingly.

Addendum No. 7 consists of 17 pages of Response to Questions, 41 re-issued IFB Drawing Sheets, and 6 re-issued Specifications Sections for a total of 117 pages. Addendum No 7 addresses some of the bidder questions received. Subsequent addendum will address the outstanding bidder questions and revisions to the IFB Drawing Set and the IFB Project Manual.

Submit written questions during the bid phase via email to Jake Jacobs with cc to Cheryl Coviello.

Jake.Jacobs@collierseng.com

Cheryl.Coviello@gza.com

Make the following changes to the Bidding Documents, Project Manual and Specifications:

REVISION TO ADDENDA

1. Addendum 6, Response 2 and Response 12:

REVISE the project completion dates as follows:

Phase 1 shall be completed for 28 February 2026.

Phases 2 and 3 shall be substantially completed by 28 February 2027.

Phases 2 and 3 shall have final completion on or before 31 March 2027.

2. Addendum 6, Response 26:

ADD to the response "Conduit will be provided by this contract as depicted on E-201, re-routing existing 4" service conduits to the new padmount equipment. Provide cost for all cabling downstream and including the load side of the switch ways of the primary metering cabinet to the transformers. The line side of the primary metering cabinet is the point of common coupling with CMP."

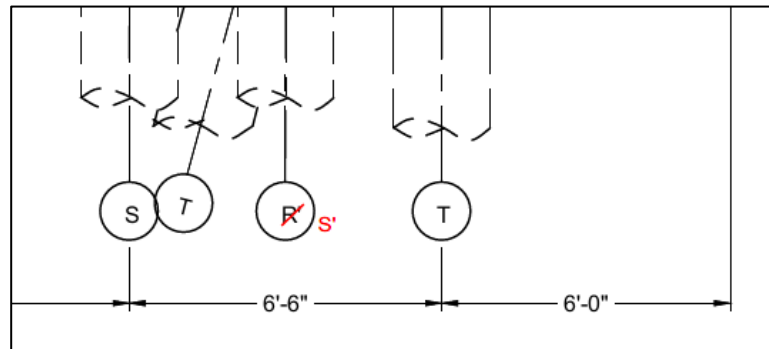
Responses to questions on previous addenda.

3. Addendum 4, Response 7 question: To keep bids consistent, please update the pile schedule to indicate required coating length for each pile or provide anticipated mudline at each pile in the bid schedule.

Response 3: See the attached reissued IFB Drawing S-134 (rev 1) for coating lengths to assume for bidding purposes.

4. Addendum 5, Reissued Drawing S-123: The sheet S-123 issued with addendum #5 shows Rock Anchors in the plumb Pile at Rows Q', R', and what looks to be S'. The pile on the drawing also seem to be mis-labeled with S' missing, two R' 's labeled. Please advise and provide a new Pier Pile and Rock Anchor Table as needed. Please also provide a corrected version of sheet S-123.

Response 4: Piles in Rows Q', R', and S' are battered along the longitudinal length of the pier (i.e. into the page on S-123). See Sheet S-114 for the batter orientation. On IFB Drawing S-123, **REVISE** the R' pile designation between the S and T designations to S'.



5. Addendum 5, Issued IFB Drawing S-160: Please provide specification for the Brow detailed on DWG S-160.

Response 5: The Brow specification will be provided after contract award. The attached reissued IFB Specification Section 00 41 13 Contractor Bid Form includes a \$250,000 bid allowance for the brow.

RESPONSE TO GENERAL QUESTIONS

Intentionally left blank.

RESPONSE TO IFB DRAWINGS QUESTIONS

6. IFB Drawing S-107: Will the concrete curb on top of the Modular Block Wall System be anchored to the cap block on the retaining wall.

Response 6: Yes. The concrete curb connection shall be designed for a 100 plf transverse live load.

7. IFB Drawing S-107: Please provide loading information on the guardrail/curb from the edge of roadway.

Response 7: Concrete curb connection shall be designed for a 100 plf transverse live load.

8. IFB Drawing S-107: Please provide the connection detail for the curb on sheet S-107.

Response 8: The concrete curb connection to the modular block wall shall be included in the Contractor's design submittal for the modular block wall.

9. IFB Drawing S-107: A significant portion of the wall will be constructed on old fill (per GZA boring GZA-2). There are no guidelines or recommendations in the Geotech letters related to the suitability of the existing fill to support the retaining wall. A 2500 psf allowable net bearing capacity is required.

Response 9: Contractor and Contractor's Engineer shall be responsible for evaluating existing information (e.g. boring logs), design of the Modular Block Wall, and any necessary improvements (e.g. surface compaction) of bearing soils. Include the design allowable bearing capacity in the Contractor's design submittal for the modular block wall. After excavation, the exposed base material shall be observed to confirm consistency with the design, per IFB Specification Section 04 20 00.01, Paragraph 3.2.A.

10. IFB Drawing S-110: Is hot-dipped galvanized rod over DCP for deadman anchors an acceptable alternative?

Response 10: Substitutions shall be submitted for review by the Contractor after contract award.

Double Corrosion Protected (DCP) is not required for tierod anchors associated with the deadman tierod anchors.

See the attached re-issued IFB Drawing S-110.

11. IFB Drawing S-111: Detail 3 on sheet S-111 shows a steel plate and vertical sheet pile wall interface. Due to the tapered design of the wall the steel plate may be obstructed by the tail of the retaining wall block. Please advise.

Response 11: Contractor's third-party engineer is responsible for design of the modular block wall and closure to the sheet pile wall.

12. IFB Drawing S-114: Note 2 states "See sheet S-123 for Rock Anchor and Rock Socket information." S-123 appears to be a pile cap detail Drawing, S-133 appears to be the Pier Rock Socket & Rock Anchor Drawing. Please confirm.

Response 12: The note was revised by Addendum 3.
See the attached re-issued IFB Drawing S-114 for additional revisions.

13. IFB Drawing S-117: How Many 100 Ton Bollards are on the Main Pier? 4 or 5?

Response 13: There are 4 (four) 100-ton mooring bollard along the new pierhead.

14. IFB S-114, S-134: The Legend Contained on the Pier Pile Plan shows a symbol for a batter pile with a 20ft Rock Anchor, 5ft Rock socket. The Pier Pile Table on Sheet S-134 indicates none of the pier piles containing rock anchors require Rock Sockets. Please clarify.

Response 14: See the attached re-issued IFB Drawings S-114 and S-134.

15. IFB S-133: Detail 3 on sheet S-133 seems to indicate the pile is to be advanced to the full depth of the rock socket. Please confirm. Please also clarify the depth required for the Cement Grout Plug in the Rock Socket indicated in the drawing and the specifications.

Response 15: Confirmed, pile is to be advanced the full depth of the rock socket.
Pier piles with 5-ft rock sockets require neat cement grout to extend above the bottom of the pipe pile at the time of the rock anchor installation. A neat cement grout plug prior to the rock anchor installation is not required to be placed at the bottom of the pipe pile.

See Addendum 6, Response 35 for clarification on the neat cement grout plug at the dolphin piles with 6" rock sockets.

See the attached re-issued IFB Drawing sheets.

16. IFB S-133: Is there a suggested construction sequence available for the main pier piles, similar to the dolphin piles on S-167?

Response 16: Contractor is responsible for sequencing work in conformance with the bid documents.

17. IFB S-133: Specification Section 31 62 23.13 Section 3.7 - Rock Socket Installation discusses the use of drill casings and maintaining an open bore for installation of the steel pipe pile. Is it the intent of the specification to require a hole be bored and temporarily cased to the rock socket depth to maintain an open hole through the overburden allowing for a pipe pile be placed in the bore hole? Or is it intended that the pile be advanced to the depth of the socket and the inside diameter of the pile drilled out and placed back with cement grout?

Response 17: The pile shall be advanced to the depth of the socket and the inside cleaned out and replaced with neat cement grout.

18. IFB Drawing S-133: Sheet S-133 seem to be portrayed as the typical detail for vertical and battered pier pile. This shows a "neat cement grout plug". Please confirm this is the same as the "concrete plug" listed in the Steel Pipe Pile Specification 31 62 23.13 table 1.2.

Response 18: The concrete plug in Specification 31 62 23.13, Paragraph 1.2 table is the 8' long concrete plug at the top of all pier piles.

Pier piles, with 5-ft rock sockets, require neat cement grout to extend above the bottom of the pipe pile at the time of the rock anchor installation. A neat cement grout plug prior to the rock anchor installation is not required to be placed at the bottom of the pipe pile.

See Addendum 6, Response 35 for clarification on the neat cement grout plug at the dolphin piles with 6" rock sockets.

See the attached reissued drawings.

19. IFB Drawing S-134: Pile Table S-134 shows all rock anchored pile without a rock socket. Plan View S-114 shows all rock anchored pile with a rock socket.

Question: Please clarify if S-134 table is correct or S-114 is correct for rock sockets in question

Response 19: See the attached re-issued IFB Drawing S-134.

20. IFB Drawing S-134: Pile Table S-134 shows pile T4
Plan View S-114 does not show pile T4

Question: Please clarify if S-134 table is correct or S-114 is correct for pile in question.

Response 20: Delete pile T4 from the S-134 table.

21. IFB Drawing S-134 and S-135: Please provide the unbonded rock anchor length in the table on drawings S-134 and S-135.

Response 21: See the attached reissued IFB Drawing S-133.

22. IFB S-155: Mooring and Breasting Platforms S-155: Do the new fender piles require pile wraps?

Response 22: No.

23. IFB Drawings S-165 - S-166: The Pile Table on Sheet S-165 state 0ft of depth for rock socket for West Dolphin #1 and West Dolphin #2 Piles. However, the detail drawing for both dolphins state 6" (typ.) Rock Sockets. Please clarify whether these piles are to be drilled and socketed 6" into rock or driven to refusal with 0ft of rock socket.

Response 23: West Dolphin #1 and West Dolphin #2 shall have 0.5' rock sockets. Revise the Table on S-165.

24. IFB Drawing S-165: Dolphin Pile Schedule indicates no Rock Sockets are required for the West Dolphins, but the drawing shows a 6" rock socket. Can the 6" socket be eliminated?

Response 24: See the attached re-issued IFB Drawing S-165.

25. IFB Drawing S-172: Note 1 States, "If bedrock is encountered above the required tip elevation, piles are to be drilled and socketed a minimum of five feet into sound bedrock." For bidding purposes, please provide a quantity of rock sockets required.

Response 25: For bidding purposes, assume all floating dock guide piles will require a 5' rock socket.

26. IFB S-172: Note 1 "If bedrock is encountered above the required tip elevation, piles are to be drilled and socketed, a minimum of five feet into sound bedrock". Should A 5' rock socket for all piles be assumed in the base bid? or would this be considered additional work?

Response 26: For bidding purposes, assume all floating dock guide piles will require a 5' rock socket.

27. IFB Drawing S-174 calls for 18" x 1/2" wall pile for the catwalk support. In order to be consistent with the other pile on the project, would 24" x 5/8" wall pile be acceptable?

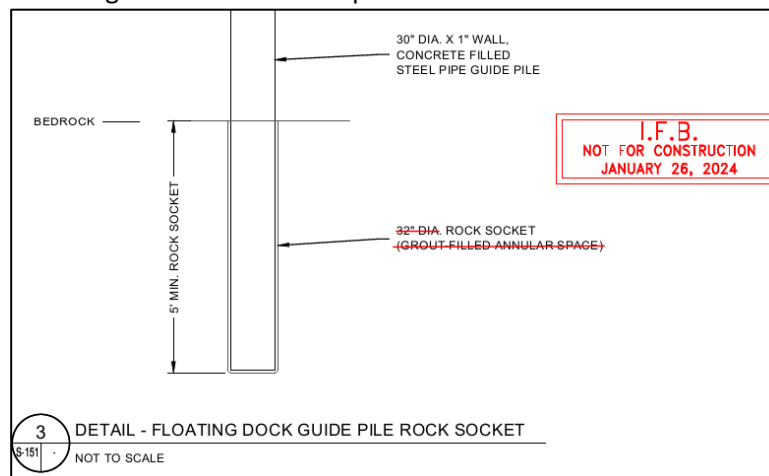
Response 27: Substitutions shall be submitted for review by the Contractor after contract award. For this instance, larger piles would be acceptable provided that any modification (design and construction) to the support structure due to the change in the pile size are made at no additional cost to the Owner.

28. IFB Drawing S-176: Floating Breakwater Pile Sockets on sheet S-176 requires a grout filled annular space. No other pile sockets have this requirement. The typical bullet proof method to achieve this would be an oversized temporary casing seating in bedrock so the 32" socket can be drilled and tremie grouted before the pile is placed in the socket.

Question:

- a. Please confirm a grout filled annular space is required.
- b. If it is required, perhaps the function is to resist pullout, would a high capacity rock anchor be substituted for the grout?

Response 28: Grout filled annular space will not be required if the floating breakwater guide pile rock sockets are installed within the tolerances of Section 31 62 23.13 Paragraph 3.8.1. In IFB Drawing S-176, Detail 3/S-151, DELETE the diameter of the rock socket and grout filled annular space from the callout.



29. IFB Drawing M-701: Does backpressure control valve spec'd meet code requirements? Sub contractor states "backpressure valves do not reseal consistently, any contamination or dirt in the pipeline will also cause pilots to not work correctly" Please advise if control valve is acceptable if backpressure valve is not up to code.

Response 29: There are no code issues using this type of valve. It functions like a typical pilot operated PRV but with the pilot upstream. It will not be used for full isolation during operation, but will modulated to maintain an upstream pressure.

30. IFB Drawing E-202: 2" C runs for data inside Andrews Building – E202 & C201 (symbol -UGT-): Please provide better plan view information for determining distance of 2" C and fiber runs from exterior building wall to IT room in Andrews Hall. No interior building floor plans have been provided for Andrews Hall. Location of IT room is unknown.

Response 30: For consistency and clarity of bids, contractor shall assume the 2" C and fiber run lengths within Andrew Hall to be 80 feet from exterior to the IT Closet.

31. IFB Drawing E-202: [(5) 2" C for data. (3) to utility building with fiber optic cable run in (2) of them, (1) spare. (2) to Andrews Hall with (2) fiber optic cables run in (1). (1) spare]: Please confirm type of fiber optic cable (including number of fiber strands) and type of fiber optic terminations (LC?) for each run of fiber optic cable and termination proposed by indications on drawing E202.

Response 31: Fiber Optic cables shall be 6 pair 12 strands single mode. Termination type shall be LC-LC. Contractor shall terminate all fiber optic ends.

32. IFB Drawing E-205: Note 2: Please confirm that the requested 2#6 and 1#10 in 1" C from Panel A1, is intended to serve the equipment shown by drawing E204, Note 1; and also to be routed within the 2" conduit required by drawing E202, where indicated: [2" C for utility building heat trace controls].

Response 32: No, it is not. The heat trace circuit shown on E-205 supplies power to the controller shown on the exterior south wall of the same sheet (E-205). This circuit is different than the power identified on E-204.

RESPONSE TO IFB PROJECT MANUAL QUESTIONS

33. IFB Specification Section 01 05 00: Specification 01 05 00 - Supplemental Conditions, Part 11 requires the contractor comply with all Provisions of the Buy American Act, 41 U.S.C. Sections 8301-8305. Please confirm the Buy American Provisions apply to the Floating Concrete Attenuators.

Response 33: The concrete floating breakwater is not required to meet the provisions of the Buy American Act.
In Specification 01 05 00 - Supplemental Conditions, Part 11, in the last sentence, after "...will not apply to the" **ADD** "Concrete Floating Breakwater as specified in Specification Section 35 51 13.24,".

PART 11 BUY AMERICAN ACT REQUIREMENT

11.1 Contractor shall apply, comply with, and implement all provisions of the Buy American Act, 41 U.S.C. §§ 8301-8305. The Project is a public work of the Federal Government under 41 U.S.C. § 8301. Contractor shall only use material which comply with the Buy American Act unless specifically noted otherwise. The Buy American Act will not apply to the Concrete Floating Breakwater as specified in Specification Section 35 51 13.24, Marine Fenders as specified in Specification Section 35 59 13 and to the Cavoted AMP SPO as specified in the project documents.

34. IFB Specification Section 01 05 00: Due to construction schedule and aggressive start date, we request that the owner remove the building permit from contractor's scope and obtain themselves.

Response 34: The Building Permit, and associated Town permits for the Building Permit, are the contractor's responsibility. Contractor shall base the fee(s) on their combined bid value for the Base Bid + Allowance item + Bid Alternate Items.

35. IFB Specification Section 03 31 30: Specification section 03 31 00 states that penetrating sealant is to be applied to the exposed concrete surfaces. Please define "exposed". Is this considered just deck surfaces, or the face and the underside of the pier as well? Will it be required on precast concrete?

Response 35: Penetrating sealant to be applied to deck and curb.

36. IFB Specification 23 07 19: Sub PH 2.2 A and 2.9 C calls to jacket all interior pipe located in the boiler plant and adjacent room in Andrews Hall with Pitwrap and aluminum jacket. This specification is common for vault piping and piping that has the potential to be immersed in water at times. This is a very costly application with no benefit in this application. Would omitting the Pitwrap jacket and using aluminum jacket only be acceptable?

Response 36: Yes, Pittwrap may be omitted for the indoor piping in the plant. Also, to be clear, only newly provided pipe in the plant needs to be insulated. Existing pipe can be left alone.

See the attached revised Specification Section 23 07 19. Revisions are highlighted.

37. IFB Specification 23 07 19: Sub PH 2.3 B states that all distribution pipes located in the vault, pier trench and above grade are to be insulated with Pyrogel high performance blanket, jacketed with Pitwrap and stainless-steel jacket. This is an uncommon and costly application which has no recommended industry, install practices. Pyrogel blankets may compress under the weight of the combined jackets of stainless steel and Pitwrap. The industry standard for this application would be Foamglas and Stainless-steel jacket. Foamglas has a very high compression of 620 KPA or 90 psi, zero water permeability, and near zero wick capability making it an excellent exterior and underground insulation. Foamglas is designed and has install applications specifically for Pitwrap and Stainless-steel jacket. Foamglas is readily available with lead times of no more than 3 weeks. Pyrogel has significant lead times and is not available at this time, with no estimated ship dates (Supplier states they may be able to get back to normal lead times after June but no guarantee). Would Foamglas and Pitwrap with stainless steel jacket be an acceptable alternative?

Response 37: Due to its lesser performance in thermal conductivity, Foamglas insulation would need to be significantly thicker to match the thermal performance of Aerogel (over 5" thick for steam). This greater thickness will pose a conflict for the pipe

supports (T slides, guides), the steam trap stations that will be installed right next to the condensate pipe, and the trench dimensions itself. We have successfully used aerogel insulation in steam distribution applications for underground piping and in vaults, including at other Maritime academies, and for preinsulated steam piping. We have used aerogel on recent projects as well with no lead time issues. Consider looking at different suppliers or different aerogel manufacturers. Refer to IFB Specification Section 23 07 19 part 2.1 and 2.5 for manufacturers.

Note, Pittwrap is not required for aerogel insulation.

38. IFB Specification 23 07 19: 2.6 B requires the use of Pyrogel XTE in all removable insulation blankets. Industry standard and common application uses Tempmat insulation which is rated to 1200 degrees with negligible water absorbency and designed for this type of application. Tempmat is readily available with little to no lead times. Pyrogel has significant lead times and is not available at this time with no estimated ship dates (Supplier states they may be able to get back to normal lead times after June but no guarantee). Would Tempmat insulation be an acceptable alternative?

Response 38: Substitutions shall be submitted for review by the Contractor after contract award.

39. IFB Specification 26 05 33.13: Par 2.15.B.1, 2 or 3: Please specify wall thickness for RTRC (fiberglass) conduit installed within in proposed electrical utility trench on new pier.

Response 39: Minimum wall thickness for RTRC:
3/4" thru 4" diameter = 0.070";
5"diameter = 0.096".

40. IFB Specification Section 26 05 33.13: Conduit Applications- Par 2.01.H & I: Please confirm that conduits breaking out of electrical utility trench on pier, and located above and below precast planks outside of trench, are intended to be galvanized rigid steel conduit (non-stainless) type conduit where exposed above and below pier.

Response 40: Correct. Galvanized Rigid Steel Conduit.

41. IFB Specification 26 12 19: Equipment Prepurchase Contract for Transformers –: Please specify the value of the equipment prepurchase contract to be borne by Electrical Contractor. Does EC carry costs for value of Equipment Prepurchase Contract in EC's bid? If so, how much?

Response 41: No. The equipment cost of the pre-purchase transformers is not to be carried in the bid. Please see Specification 261219 – 1.02 for the scope costs to cover for the transformers.

42. IFB Specification Section 31 62 19.15: The Pile Protection System Specification Scope of Work states the pile protection systems listed are for the existing timber and steel piles. Are their any pile protection requirements required for the new timber piles beyond the treatment requirements?

Response 42: No.

43. IFB Specification Section 31 62 23.13: Contract Drawings. The Work includes but is not limited to driving or drilling pier and dolphin piles to sound bedrock; socketing piles within bedrock where indicated, to the depths indicated and specified..." Rock Socket depths are indicated on the drawings, however, the specification indicates "sound rock". Please provide a unit price item for additional pile lengths and additional drilling to reach sound rock in the event the bid lengths are not sufficient to reach sound rock.

Response 43: Per the IFB Project Manual, the Contractor provides a Schedule of Values that specifies the dollar values of portions of the Work. It is reviewed by the Owner and Owner's Engineer and is used to document progress payments. See IFB Specification Sections 00 21 13 Instructions to Bidders; 00 41 13 Contractor Bid From; 00 71 00 Definitions; and 00 72 13 General Conditions.

The Schedule of Values shall include unit pricing for individual items, such as Furnish and Install piles. Those unit pricing will be used for progress payments and additions or deductions to the contract price for quantities installed.

44. IFB Specification Section 31 62 23.13: Steel Pipe Piles. Paragraph 3.8, Pile Testing, Paragraph B states, "Prior to any other pile installation, Dynamic Pile Testing (PDA) shall be performed by the Contractor on two production pier piles..." For bidding the purposes, is the Existing Pier Replacement (phase 2) and Pier Extension (phase 1) considered one pier or two piers?

Response 44: The Owner's engineer will perform PDA testing. See the attached revised IFB Specification Section 31 62 23.13.

45. IFB Specification Section 31 62 23.13: Steel Pipe Piles, Section 3.2 requires probing to be performed prior to the ordering of piles. Due to the anticipated lead times for the pile, the current schedule does not provide adequate time for performing probing prior to ordering pile. We request this requirement be waived and provisions in the specification be made to allow for payment of additional pile length as needed.

Response 45: Contractor shall complete the probing program per the project requirements. Per the IFB Project Manual, the Contractor provides a Schedule of Values that specifies the dollar values of portions of the Work. It is reviewed by the Owner and Owner's Engineer and is used to document progress payments. See IFB Specification Sections 00 21 13 Instructions to Bidders; 00 41 13 Contractor Bid From; 00 71 00 Definitions; and 00 72 13 General Conditions.

The Schedule of Values shall include unit pricing for individual items, such as Furnish and Install piles. Those unit pricing will be used for progress payments and additions or deductions to the contract price for quantities installed.

46. IFB Specification Section 31 62 23.13: The Pipe Pile Specification calls for the splices to be made 5' below the mud line. Due to the pile lengths required for the work this will add significant shipping cost to the pile. Additionally, there locations where the borings indicate there may not be sufficient overburden to permit this provision. Please advise.

Response 46: Contractor shall plan deliveries of materials in accordance with the project requirements and budget for one splice per pile in accordance with Section 31 62 23.13, Paragraphs 2.1.A.1 and 3.7. See the attached re-issued Specification Section 31 62 23.13.

47. IFB Specification Section 31 62 23.13: If the probing program results in required order lengths being longer than the bid table, how will the owner compensate for the excess pile lengths in cost and schedule?

Response 47: Per the IFB Project Manual, the Contractor provides a Schedule of Values that specifies the dollar values of portions of the Work. It is reviewed by the Owner and Owner's Engineer and is used to document progress payments. See IFB Specification Sections 00 21 13 Instructions to Bidders; 00 41 13 Contractor Bid From; 00 71 00 Definitions; and 00 72 13 General Conditions.

The Schedule of Values shall include unit pricing for individual items, such as Furnish and Install piles. Those unit pricing will be used for progress payments and additions or deductions to the contract price for quantities installed.

48. IFB Specification Section 31 62 23.13: Project manual section 31 62 23.13 subsection 1.5.A.1.e requires the contractor to submit driving criteria for all piles, including drilled and rock socketed piles. Is the intent of this section to require the contractor to seat the pipe pile in the rock socket with an impact hammer following the drilling procedure? Please clarify the driving criteria for the rock socketed pile.

Response 48: The Contractor is not required to impact drilled piles to prove ultimate capacity. Contractor shall demonstrate all socketed piles will achieve ultimate capacity in accordance with Section 31 62 23.13 Paragraph 3.9.G.

49. IFB Specification Section 31 62 23.13 and IFB Drawing S-133: The Pile Bid Length Table listed in Spec 31 62 23.13 calls for concrete plugs in the Pier Piles. Sheet S-133 shows a plug, but the depth is not specified. Further, Sheets S-120, S-126, S-129 provide a note stating "24in dia x 0.625in stee pipe pile w/concrete plug, see Detail 3/S-122" however, sheet S-122 does not provide a Detail #3. Please provide the required detail and depth of the pile plugs. Please also confirm all pier piles receive the same plug regardless of whether they are socketed, driven, or have rock anchors installed.

Response 49: All pier piles receive the 8' concrete plug at the top of pile, per IFB Drawing S-132.

50. IFB Specification Section 31 62 23.13: Specification Section 31 62 23.13 Section 3.7 - Rock Socket Installation discusses the use of drill casings and maintaining an open bore for installation of the steel pipe pile. Is it the intent of the specification to require a hole be bored and temporarily cased to the rock socket depth to maintain an open hole through the overburden allowing for a pipe pile be placed in the bore hole? Or is it intended that the pile be advanced to the depth of the socket and the inside diameter of the pile drilled out and placed back with cement grout?

Response 50: The pile shall be advanced to the depth of the socket and the inside cleaned out and replaced with neat cement grout.

51. IFB Specification Section 31 62 23.13: The Pile specification provides the Axial Working Capacity of the pile. Please provide the theoretical Ultimate Load Capacity of each pile type for equipment selection purposes.

Response 51: See the attached re-issued IFB Specification Section 31 62 23.13.

52. IFB Specification Section 31 62.23.13: What is the maximum allowable horizontal from vertical deviation for Pier and Mooring Dolphin Piles?

Response 52: See the attached re-issued IFB Specification Section 31 62 23.13.

53. IFB Specification Section 31 62 23.13: In the "Steel Pipe Pile" specifications, 1.10C. We are instructed not to install piles until all waterfront removals and demolition within 20 feet of pile driving has been performed. Will we be permitted to install the phase I piling at line I and Line J prior to demolition of existing timber pile near line I' ?

Response 53: See the attached re-issued IFB Specification Section 31 62 23.13

54. IFB Specification Section 31 62 23.13: calls for 4300 LF order length of floating dock guide piles. Calculated 4407 LF from the construction drawings. Please clarify

Response 54: See the attached re-issued IFB Specification Section 31 62 23.13. Bid lengths shall be based on IFB Drawings.

55. IFB Specification Section 31 62 23.13: calls for 24,810 LF order length of main pier piles. Calculated 24080 LF from the construction drawings. Please clarify

Response 55: See the attached re-issued IFB Specification Section 31 62 23.13. Bid lengths shall be based on IFB Drawings.

56. IFB Specification Section 31 62 23.13: Steel Pipe Piles, Sections 1.2 & 1.3 discuss installing the piles to sound bedrock. Please provide a definition of and parameters for the term "Sound Bedrock".

Response 56: Sound bedrock shall be considered as having a minimum Field Hardness of medium with a minimum Weathering of moderate in accordance with ASTM D6032 and NAVFAC Design Manual 7.01 respectively and as indicated in the boring logs.

57. IFB Specification 31 62 23.13: Steel Pipe Piles, Section 1.10, paragraph C states, "Do not install piles until all waterfront removals and demolition within 20 feet of pile driving has been performed as required to complete the work specified herein." This may prevent the installation of up to the first two pile bents in the pier extension from being installed prior to the removal of the existing pier. Please clarify if this is the intent of the specification.

Response 57: See the attached re-issued IFB Specification Section 31 62 23.13.

58. IFB Specification Section 31 68 13: Rock Anchors indicates independent third party testing for the grout associated with the anchors. The specification appears to be silent on whether independent

3rd party testing of the anchors themselves is required. Further Section D Test Equipment & Instrumentation, Paragraph 6 requires that the contractor coordinate with the engineer (Owners Representative) on locations for the strain gauges for the performance test anchors. Please clarify who is responsible for the strain gauge testing and whether an independent third party testing agency is required for sacrificial, performance, or proof testing, or all rock anchor testing regardless of type.

Response 58: Contractor is responsible for all rock anchor testing. An independent third-party testing agency is not required for the rock anchor testing. All rock anchor testing shall be performed in the presence of the Engineer, per Specification Section 31 68 13, Paragraph 3.2.B.8.a.

59. IFB Specification Section 35 59 13: Specifications say to size panel according to the drawings. There are no dimensions on the drawing. Can you please provide?

Response 59: 14' x 14' panel is indicated on IFB Drawing S-161. Minimum contact surface shall be 12' x 12' with beveled edges. Top of panel shall be no higher than the top of curb, Elev. =15.1 (project datum = NAVD88).

60. IFB Specification Section 35 59 13: Can you please confirm the fender panel dimensions. Marine Fenders specification section 2.2.A. says that vertical length and horizontal height shall be as shown on drawings but I don't see the panel dimensions anywhere on in the drawing set.
- If dimensions are provided, are they minimum dimensions? Or can they be adjusted to optimize the design or shipping of the panels?
 - Alternatively, can you provide a maximum hull pressure for the manufacturer to design the fender panel sizing based on that requirement?

Response 60: 14' x 14' panel is indicated on IFB Drawing S-161. Minimum contact surface shall be 12' x 12' with beveled edges. Top of panel shall be no higher than the top of curb, Elev. =15.1 (project datum = NAVD88).

Maximum allowable hull pressure varies depending upon location along the hull. See IFB Drawing G-003 Design Criteria for mooring and berthing criteria under Pier and Mooring Dolphin Design Ship – National Security Multi-Mission Vessel (NSMV). The fender system indicated in the bid documents has been designed to accommodate the design vessel (NSMV) and criteria stipulated by MARAD.

61. IFB Specification Section 35 59 13: Marine fender specification section 2.1.C.1. says performance should be at berthing angles of up to 90°. Can you confirm this berthing angle or provide clarification on the interpretation of 90°?

Response 61: In IFB Specification Section 35 59 13, Paragraph 2.1.C.1, end of the last sentence, **DELETE** "at berthing angles up to 90 degrees".

C. Performance Requirements

1. The proposed fenders shall be capable of absorbing the design energy before reaching the design reaction at the design deflection stated below. The tolerance for performance shall be +/- 10%. Each of the molded cell fenders shall have the following performance characteristics ~~at berthing angles up to 90 degrees~~

See IFB Drawing G-003 Design Criteria for mooring and berthing criteria under Pier and Mooring Dolphin Design Ship – National Security Multi-Mission Vessel (NSMV).

62. IFB Specification Section 35 59 13: Is there any standoff limitation (min or max) for the rubber fender panel systems?

Response 62: Standoff shall be 5'-6".

63. IFB Specification Section 35 59 13.02: The Timber Pile Specification calls for 12" diameter piles. However, the specification also calls for a Class A pile in accordance with ASTM D-25. This class of pile would require a 14" diameter 3' from the end of the pile. Please clarify what is required.

Response 63: Timber piles shall be 14-inch, Class A piles. See the attached re-issued IFB Specification Section 35 59 13.02

OTHER REVISIONS TO IFB SPECIFICATIONS

IFB 00 41 13 Contractor Bid Form

REPLACE pages 1 and 2 of 2 with the attached pages 1 and 2 of 2 for incorporation of Allowances and Alternate Bid items.

IFB Specification Section 01 05 00 Supplemental Conditions

ADD Part 12 Bid Allowances and Alternate Bid Items for a general description of the Bid Allowance item and the Bid Alternate items.

PART 12 BID ALLOWANCES AND ALTERNATE BID ITEMS

12.1 All Work shall be included in the Base Bid except for the identified Allowances and Alternate Bid Items. See the Project Documents for designations, details and requirements for the Allowances and Alternate Bid Items. General descriptions are provided below.

A. Prefabricated Brow Allowance. The prefabricated aluminum structure providing personnel access from the pier deck to the NSMV vessel, as part of Phase 1 Work.

B. Bid Alternate 1: Maintenance Dredge. Maintenance dredge within the Inner Boat Basin, as part of Phase 2 Work.

C. Bid Alternate 2: Existing Mooring and Breasting Platforms Repairs. Routine maintenance repair of the existing Mooring and Breasting platforms, including concrete repairs, pile wraps, replacement, and new timber fendering and other work identified in the Project Documents, as part of Phase 2 Work.

D. Bid Alternate 3: Existing Structures Replacement, Improvements & Repairs. Routine maintenance of the Timber Travel Lift Runway Piers, East Bulkhead, and timber floating docks and guide piles. Replacement of the retaining wall and access stairs. New pump out station. Work shall be completed as part of Phase 2.

E. Bid Alternate 4: West Floating Dock System. New timber floating docks, steel guide piles, prefabricated aluminum gangways and associated fit-out items, as part of Phase 3 work. Utilities for the West Floating Dock System shall be installed and properly capped at the pier at the gangways as part of Phase 2 Work.

F. Bid Alternate 5: Floating Breakwater System. New floating breakwater, steel guide piles and associated fit-out items, as part of Phase 3 work.

IFB Specification Section 02 22 11 Pre- and Post-Construction Condition Surveys

REMOVE the specification section in its entirety from the project requirements. MMA's Engineer will complete these surveys.

IFB Specification Section 02 22 13 Movement and Vibration Assessment

REPLACE the specification section in its entirety with the attached 02 22 13.01 Movement and Vibration Monitoring – Contractor's Responsibilities. MMA's Engineer will complete the movement and vibration program.

IFB Specification Section 23 07 19 Insulation for Piping and Equipment.

REPLACE the specification section in its entirety with the attached reissued version. (Revisions are highlighted in yellow.)

IFB Specification Section 31 62 23.13 Steel Pipe Piles

REMOVE pile testing from the Contractor's responsibility. MMA's Engineer will complete the pile testing program. **REPLACE** the specification section in its entirety with the attached reissued version. (Revisions are highlighted in yellow.)

IFB Specification Section 31 68 13 Rock Anchors.

REPLACE the specification section in its entirety with the attached reissued version. (Revisions are highlighted in yellow.)

IFB Specification Section 35 59 13.02 Timber Replacement and Timber Fender System

REPLACE the specification section in its entirety with the attached reissued version. (Revisions are highlighted in yellow.)

OTHER REVISIONS TO IFB DRAWINGS

REPLACE the following IFB Drawing Sheets with the attached.

1. G-002 DRAWING SHEET INDEX
2. G-004 NOTES-1
3. G-101 OVERALL WORK PLAN
4. C-101 DREDGE PLAN AND SECTION BID ALTERNATE 1
5. C-302 DREDGE SECTIONS BID ALTERNATE 1 MAINE MARITIME
6. S-104 WATERFRONT STRUCTURES LAYOUT PLAN
7. S-105 WEST BULKHEAD AND RETAINING WALL PLAN -1
8. S-106 WEST BULKHEAD AND RETAINING WALL PLAN -2
9. S-107 WEST BULKHEAD AND RETAINING WALL PLAN SECTIONS - 1
10. S-109 WEST BULKHEAD AND RETAINING WALL PLAN DETAILS - 1
11. S-110 WEST BULKHEAD AND RETAINING WALL PLAN DETAILS – 2
12. S-111 WEST BULKHEAD AND RETAINING WALL PLAN DETAILS - 3
13. S-112 EAST BULKHEAD REPAIR SECTION BID ALTERNATE 3
14. S-113 PIER LAYOUT PLAN
15. S-114 PIER PILE PLAN
16. S-116 PIER DECK PLANK PLAN
17. S-119 NORTH EDGE BEAM ELEVATION AND SECTIONS
18. S-120 PIER SECTIONS – 1, SECTION A - TYPE 1 CAP
19. S-122 PIER SECTIONS – 3, SECTION C – TYPE 5 CAP
20. S-123 PIER SECTIONS – 3, SECTION D – TYPE 4A CAP
21. S-124 PIER SECTIONS – 3, SECTION E – TYPE 4B CAP
22. S-126 PIER SECTIONS – 7, SECTION G – PILE CAPS 4A/4B @ TRENCH
23. S-127 PIER SECTIONS – 8, SECTION H – PILE CAP TYPE 5A
24. S-128 PIER SECTIONS – 8, SECTION H – PILE CAP TYPE 5B
25. S-133 PIER PILE AND ROCK ANCHOR DETAILS
26. S-134 PIER PILE TABLE
27. S-140 CAST-IN-PLACE PIER PILE CAP DETAILS - TYPE 4A/4B
28. S-141 CAST-IN-PLACE PIER PILE CAP DETAILS – TYPE 5A
29. S-142 CAST-IN-PLACE PIER PILE CAP DETAILS – TYPE 5B
30. S-146 NORTH EDGE BEAM DETAILS
31. S-147 EDGE BEAM SECTIONS AND DETAILS – 1
32. S-148 EDGE BEAM SECTIONS AND DETAILS - 2
33. S-154 PRE-CAST UTILITY TRENCH DETAILS
34. S-155 MOORING AND BREASTING PLATFORMS REPAIRS AND MODIFICATIONS
35. S-161 FENDER SYSTEM SECTIONS AND DETAILS
36. S-165 MOORING DOLPHIN SECTIONS - 1

- 37. S-167 MOORING DOLPHIN PILE AND ROCK ANCHOR DETAILS
- 38. S-169 FLOATING DOCK REPAIRS AND MODIFICATIONS
- 39. S-171 WEST FLOATING DOCKS – PLAN
- 40. S-176 FLOATING BREAKWATER PLAN, SECTIONS AND DETAILS
- 41. S-177 TRAVEL LIFT PLAN AND SECTIONS

GENERAL NOTES:

- 1. THE FOLLOWING PERMITS AND APPROVALS HAVE BEEN SECURED FOR THE PROJECT. SEE THE PROJECT SPECIFICATIONS FOR A COPY OF EACH ISSUED PERMIT. THE CONTRACTOR IS RESPONSIBLE FOR SECURING ANY ADDITIONAL PERMITS REQUIRED TO PERFORM THE WORK.
A. DEPARTMENT OF ARMY, MAINE GENERAL PERMIT, CORPS PERMIT NO. NAE-XXXX-XXXX
B. MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, PERMIT NO. XXXXXX (STRUCTURES)
C. MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, PERMIT NO. XXXX (MAINTENANCE DREDGE)
D. SUBMERGED LANDS LEASE
E. MAINE WHARVES AND WEIRS ACT
F. TOWN OF CASTINE SITE PLAN APPROVAL AND FINDINGS OF FACT
G. TOWN OF PENOBSCOT FILL PERMIT
2. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR COMPLIANCE WITH THE TERMS AND CONDITIONS OF ALL PERMITS ISSUED BY ANY REGULATING AGENCY HAVING JURISDICTION OVER THE WORK OF THIS PROJECT.
3. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING WORK CONFORMS WITH ALL FEDERAL, STATE, COUNTY AND LOCAL CODES HAVING JURISDICTION OVER SUCH WORK.
4. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OSHA REGULATIONS AND SAFETY PROCEDURES TO ENSURE PERSONNEL HEALTH AND SAFETY. THE CONTRACTOR MUST MAINTAIN A SAFE AND CLEAN WORKING ENVIRONMENT AND SHALL ASSURE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) IS WORN AT ALL TIMES. IN AREAS WHERE MAINE MARITIME ACADEMY PERSONNEL OR STUDENTS AND/OR THE PUBLIC MAY BE AFFECTED BY THE WORK, THE CONTRACTOR SHALL CORDON OFF THE WORK AREA.
5. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR MEANS, METHODS, AND SAFETY OF WORK.
6. THE CONTRACTOR SHALL HAVE SOLE RESPONSIBILITY FOR PROVIDING ALL MATERIALS, EQUIPMENT, AND TOOLS. THE OWNER ASSUMES NO RESPONSIBILITY OR LIABILITY FOR ANY MATERIALS, EQUIPMENT OR TOOLS STORED ON ITS PROPERTY.
7. EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON TOPOGRAPHIC SURVEY COMPLETED BY HALEY WARD, INC. ON SEPTEMBER 1, 2022 AND LIMITED TOPOGRAPHIC DATA COLLECTION BY GZA GEOENVIRONMENTAL, INC. ON AUGUST 30-31, 2022. HYDROGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC. ON AUGUST 30-31, 2022. THE CONDITIONS SHOWN ON THE CONTRACT DRAWINGS REPRESENT THE CONDITIONS AT THE TIME OF THE SURVEYS. PROPERTY LINES SHOWN ARE BASED ON SURVEY BY HALEY WARD, INC. COMPLETED ON MAY 5, 2023.
8. UTILITIES SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON RECORD INFORMATION PROVIDED BY MAINE MARITIME ACADEMY AND SURFACE FEATURES VISIBLE AT THE TIME OF THE TOPOGRAPHIC SURVEY. NO EXCAVATIONS WERE MADE DURING THE COURSE OF THE SURVEY TO VERIFY OR LOCATE ANY UNDERGROUND UTILITIES OR STRUCTURES.
A. "EXISTING WATER STREET (WEST & EAST) INFRASTRUCTURE PLAN & PROFILE", PREPARED BY OLVER ASSOCIATES, INC., MANDY HOLWAY OLVER, PE #5765, AND DATED DECEMBER 2016.
9. EXISTING STRUCTURES AND DETAILS SHOWN ON THE CONTRACT DRAWINGS ARE TAKEN FROM ARCHIVE DESIGN DOCUMENTS PROVIDED BY MAINE MARITIME ACADEMY. THE INFORMATION IN THE ARCHIVE DOCUMENTS HAS BEEN SUPPLEMENTED THROUGH LIMITED FIELD OBSERVATIONS AND DATA COLLECTION. STRUCTURES ARE SHOWN IN 'AS DESIGNED' AND/OR 'MODIFIED' CONDITIONS. THE OWNER AND THE ENGINEER OF RECORD MAKE NO WARRANTY AND ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THIS INFORMATION. ACTUAL CONDITIONS MAY DIFFER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL RELEVANT ELEVATIONS, DIMENSIONS, AND DETAILS PRIOR TO THE START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS IN THE FIELD, BEFORE ORDERING ANY MATERIAL, COMMENCING ANY FABRICATION, OR PERFORMING ANY WORK. THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE, IN WRITING, OF ANY CONDITIONS OR DIMENSIONS WHICH VARY FROM THOSE SHOWN ON THE DRAWINGS AND INCORPORATE SUCH VARIATIONS INTO THE CONSTRUCTION, AS APPROVED BY THE OWNER.
11. THE CONTRACTOR SHALL PERFORM AN UNDERGROUND UTILITY SURVEY TO MARK-OUT AND IDENTIFY ALL UNDERGROUND UTILITIES WITHIN THE AREA OF INFLUENCE OF WORK.
12. THE CONTRACTOR SHALL IDENTIFY ANY UTILITIES, STRUCTURES, OR ANY OTHER ELEMENTS WHICH MAY IMPEDE WORK. UTILITY AND/OR STRUCTURE RELOCATIONS, IF NECESSARY, SHALL BE COORDINATED THROUGH THE OWNER'S REPRESENTATIVE.
13. ALL SAFETY REGULATIONS SHALL BE FOLLOWED STRICTLY. METHOD OF CONSTRUCTION AND ERECTION OF STRUCTURAL MATERIALS ARE THE CONTRACTOR'S RESPONSIBILITY.
14. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SURVEY CONTROL, AT ALL TIMES, TO ESTABLISH AND MAINTAIN ALL LINES AND ELEVATIONS.
15. THE CONTRACTOR SHALL NOTIFY THE OWNER WHEN UNANTICIPATED OR APPARENTLY DANGEROUS CONDITIONS ARE UNCOVERED DURING CONSTRUCTION OR DEMOLITION.
16. THE CONTRACTOR SHALL EXERCISE ALL NECESSARY CARE TO PREVENT ANY DAMAGE TO EXISTING CONSTRUCTION NOT DESIGNATED FOR DEMOLITION. PROVIDE TEMPORARY BRACING AND/OR SHORING AS REQUIRED TO SUPPORT STRUCTURES DURING PERFORMANCE OF THE WORK. BRACING AND/OR SHORING SHALL REMAIN IN PLACE UNTIL NEW CONSTRUCTION PROVIDES ADEQUATE SUPPORT OR HAS ATTAINED ADEQUATE STRENGTH TO SUPPORT ITS OWN WEIGHT AND CONSTRUCTION LOADS. ANY DAMAGES RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE OWNER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE DONE TO STRUCTURES, UTILITIES AND VESSELS OR INJURIES TO THE PUBLIC RESULTING FROM THE CONTRACTOR'S WORK OR WORK OF THE CONTRACTOR'S SUBCONTRACTORS.
18. THE CONTRACTOR SHALL FURNISH, INSTALL, AND MAINTAIN TEMPORARY CONSTRUCTION FENCES AND BARRIERS AROUND THE CONTRACTOR WORK AREA TO PREVENT UNAUTHORIZED ACCESS INTO THE WORK AREAS AT ALL TIMES.
19. THE CONTRACTOR SHALL PREVENT MATERIAL FROM FALLING INTO THE BAGADUCE RIVER AND CASTINE HARBOR. ANY CONSTRUCTION MATERIAL OR DEBRIS THAT ENTERS THE RIVER OR HARBOR SHALL BE RECOVERED ON A DAILY BASIS AND DISPOSED OF BY THE CONTRACTOR.
20. CONSTRUCTION EQUIPMENT AND/OR WORK PLATFORMS IN THE WATERWAY SHALL BE LOCATED SUCH THAT THEY DO NOT BLOCK OR IMPEDE ACCESS OR PASSAGE OF BOATS OR VESSELS.
21. WORK BARGES AND/OR PLATFORMS SHALL NOT GROUND OUT OR IMPACT THE RIVER BOTTOM.
22. THE CONTRACTOR SHALL MONITOR THE WEATHER AND FORECASTS. WHEN STORMS ARE FORECASTED AND/OR APPEAR IMMINENT, THE CONTRACTOR SHALL RELOCATE AND/OR SECURE EQUIPMENT SUCH THAT IT IS LESS LIKELY TO BE IMPACTED BY THE STORM AND POTENTIAL STORM SURGE AND WAVES.
23. STORAGE, FUELING AND LUBRICATION OF EQUIPMENT AND MOTOR VEHICLES SHALL BE CONDUCTED IN A MANNER THAT AFFORDS THE MAXIMUM PROTECTION AGAINST SPILL AND EVAPORATION. FUEL, LUBRICANTS AND OIL SHALL BE MANAGED AND STORED IN ACCORDANCE WITH FEDERAL, STATE, REGIONAL, AND LOCAL LAWS AND REGULATIONS. THERE SHALL BE NO STORAGE OF FUEL ON THE PROJECT SITE. FUEL MUST BE BROUGHT TO THE PROJECT SITE AS NEEDED. EQUIPMENT OPERATIONS, ACTIVITIES, OR PROCESSES PERFORMED BY THE CONTRACTOR SHALL BE IN ACCORDANCE WITH FEDERAL AND STATE AIR EMISSION AND PERFORMANCE LAWS AND STANDARDS.
24. FUEL SPILL CONTAINMENT SYSTEMS SHALL BE ON-SITE PRIOR TO CONSTRUCTION AND REMAIN ON-SITE THROUGH THE DURATION OF THE PROJECT.
25. THERE IS NO LAND-BASED STAGING OR LAYDOWN AREA AVAILABLE AT THE PROJECT SITE. USE OF THE BACKLAND IS LIMITED TO THAT NECESSARY FOR THE WORK ITEMS RELATED TO UTILITIES AND REPLACEMENT OF THE BULKHEAD AND RETAINING WALL. DURING WORK IN THE BACKLAND, THE CONTRACTOR SHALL PROVIDE AND INSTALL TEMPORARY FENCING AND BARRIERS ALONG THE WORK ZONE PERIMETER.
26. THE SITE ACCESS AREAS SHALL BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITION FOLLOWING COMPLETION OF THE WORK. THE CONTRACTOR SHALL REPLACE ANY MATERIALS DAMAGED AS A RESULT OF THEIR WORK, TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
27. DELIVER MATERIALS TO THE CONSTRUCTION SITE AT APPROPRIATE INTERVALS SO AS TO ENSURE UNINTERRUPTED PROGRESS OF WORK.
28. MATERIALS WHICH FAIL TO COMPLY WITH SPECIFIED REQUIREMENTS, EITHER AT THE SHOP OR CONSTRUCTION SITE, SHALL BE PROMPTLY REMOVED FROM THE SITE AND REPLACED WITH ACCEPTABLE MATERIAL, WITHOUT ADDITIONAL COST TO THE OWNER, AND WITHOUT CAUSING DELAY IN WORK.
29. EMERGENCY RESPONSE VEHICLES, INCLUDING FIRE TRUCKS, MUST HAVE CONTINUOUS ACCESS TO THE WORKSHOP WITHIN PAYSON HALL. THE CONTRACTOR SHALL PROVIDE STEEL PLATES OVER EXCAVATIONS, WHEN NOT ACTIVELY WORKING AT THE EXCAVATION, TO ALLOW EMERGENCY RESPONSE ACCESS.
30. MAINE MARITIME ACADEMY WILL REMAIN OPERATIONAL DURING CONSTRUCTION. SEE THE CONSTRUCTION PHASING PLAN CONTAINED HEREIN FOR ADDITIONAL REQUIREMENTS.
31. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE ALL WORK AND ANY OTHER CONSTRUCTION OPERATIONS THAT MAY BE AFFECTED BY THE PROJECT THROUGH THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL COORDINATE THE WORK SO AS TO MINIMIZE INTERRUPTIONS IN MAINE MARITIME ACADEMY'S OPERATIONS DURING CONSTRUCTION AND WITH ACTIVITIES AT THE TOWN DOCK.
32. DURING THE COURSE OF CONSTRUCTION, OBSERVATIONS WILL BE MADE BY THE OWNER'S FIELD REPRESENTATIVE TO VERIFY EXISTING CONDITIONS AND REVIEW THE WORK PERFORMED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE ACCESS TO THE WORK AND SHALL ASSIST AND ACCOMMODATE THE OWNER'S FIELD REPRESENTATIVE BY PROVIDING LADDERS, LIFTS, FLOATS OR OTHER MEANS NECESSARY TO VIEW THE WORK.
33. ACCESS TO THE TOWN DOCK AND PRIVATELY OWNED STRUCTURES ADJACENT TO THE WORK AREA SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. TEMPORARY, SHORT-TERM, PERIODS OF NO OR LIMITED ACCESS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE IN ADVANCE. TEMPORARY NO OR LIMITED ACCESS PERIODS MUST BE AUTHORIZED BY MAINE MARITIME ACADEMY, THE TOWN OF CASTINE AND/OR THE PROPERTY OWNER(S), AS APPLICABLE.

PERONNEL SITE ACCESS NOTES:

- 1. THE CONTRACTOR'S PERSONNEL AND THEIR SUBCONTRACTORS SHALL COMPLY WITH MAINE MARITIME ACADEMY'S CAMPUS RULES AND REQUIREMENTS. ALL WORK PERFORMED SHALL BE IN ACCORDANCE WITH MAINE MARITIME ACADEMY'S AND THE STATE OF MAINE BUREAU OF GENERAL SERVICES' SAFETY AND SECURITY REQUIREMENTS AND THE CONTRACT DOCUMENTS.
2. ALL ACCESS TO THE SITE AND WORK ON THE SITE SHALL BE SUBJECT TO APPROVAL BY THE OWNER.
3. OVER THE COURSE OF THE WORK, OTHER CONTRACTORS MAY BE WORKING IN THE VICINITY OF THE PROJECT. THE CONTRACTOR SHALL COORDINATE WITH OWNER'S REPRESENTATIVE AND OTHER CONTRACTOR(S) SO AS NOT TO OBSTRUCT THE WORK OR ACCESS FOR OTHER CONTRACTOR(S).

DEMOLITION NOTES:

- 1. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS INCLUDING A FLOATING DEBRIS AND OIL ABSORBENT BOOM TO CONTAIN ALL MATERIALS THAT MAY FALL OVERBOARD. THE CONTRACTOR SHALL CLEAR AND RETRIEVE ALL MATERIALS RETAINED BY THE BOOM ON A DAILY BASIS.
2. DEMOLITION AND DISPOSAL OF MATERIALS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND CONSISTENT WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY LICENSES AND PERMITS FOR SUCH DISPOSAL.
3. EXISTING PILES TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY. VIBRATORY PILE EXTRACTION SHALL BE THE FIRST MEANS FOR PILE REMOVAL. IF VIBRATORY EXTRACTION IS NOT FEASIBLE, DIRECT PULL METHODS SHALL BE USED. A CLAMSHELL MAY BE NECESSARY FOR REMOVAL OF BROKEN OR SEVERELY DETERIORATED PILES. USE OF CLAMSHELL SHALL NOT REMOVE SOIL FROM THE RIVER BOTTOM. IF PILE EXTRACTION IS NOT POSSIBLE, THE PILE SHALL BE CUT AT THE MUDLINE AND ITS LOCATION DOCUMENTED.

STRUCTURAL AND MISCELLANEOUS STEEL NOTES:

- 1. ALL STEEL WORK SHALL BE PERFORMED ACCORDING TO THE AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS. ALL WELDING SHALL CONFORM TO AWS D1.1.
2. MATERIAL SHALL CONFORM TO THE FOLLOWING, U.N.O.:
ANGLES, BARS AND PLATES ASTM A572, GRADE 50
ROLLED SHAPES ASTM A572, GRADE 50
HSS HOLLOW TUBE ASTM A500, GRADE C
HIGH STRENGTH BOLTS ASTM F3125, GRADE A325, TYPE 1
THREADED ANCHORS, MOORING BOLLARDS ASTM F1554, GRADE 105
THREADED ANCHORS, OTHER ASTM F1553, GRADE 36
3. ALL STEEL AND MISCELLANEOUS METALS INCLUDING BOLTS, WASHERS, NUTS, ANGLES, INSERTS, PLATES, ETC. SHALL BE GALVANIZED AFTER FABRICATION BY THE HOT-DIPPED PROCESS IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A123 OR A152, AS APPLICABLE.
4. FIELD TREAT DAMAGED GALVANIZED FINISH WITH TWO (2) COATS OF ZINC RICH PAINT CONFORMING TO ASTM A780.

PILE NOTES:

- 1. STEEL PIPE PILES SHALL CONFORM TO THE REQUIREMENTS OF SECTION 31 62 23.13 AND TO THE REQUIREMENTS LISTED HEREIN AND ELSEWHERE ON THE CONTRACT DRAWINGS
a. STEEL PIPE PILES SHALL BE OF THE SIZE AND TYPE INDICATED AND CONFORM TO ASTM A252, GRADE 3.
2. STEEL SHEET PILES SHALL CONFORM TO THE REQUIREMENTS OF SECTION 31 41 16.13 AND TO THE REQUIREMENTS LISTED HEREIN AND ELSEWHERE ON THE CONTRACT DRAWINGS.
a. SHEET PILES SHALL BE OF THE SIZE AND TYPE INDICATED AND CONFORM TO THE REQUIREMENTS OF ASTM A572, GR. 50.
3. PROVIDE STEEL PILES WITH A FACTORY APPLIED COATING FROM THE TOP OF PILE TO 10 FEET BELOW MUDLINE. REFER TO SPECIFICATION SECTION 09 97 13.26.

CONCRETE NOTES:

- 1. ALL CONCRETE WORK SHALL CONFORM TO THE BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318-14, AND THE PROJECT SPECIFICATIONS.
2. CONCRETE SHALL BE PORTLAND CEMENT, ASTM C150 TYPE II WITH A 28-DAY COMPRESSIVE STRENGTH OF 5,000 PSI AND A CONCRETE MIXTURE DESIGNED FOR THE MARINE ENVIRONMENT IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
3. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A 615, GRADE 60 AND SHALL BE EPOXY COATED IN ACCORDANCE WITH ASTM 775, UNLESS NOTED OTHERWISE.
4. WELDING OF REINFORCEMENT SHALL CONFORM TO AWS D1.4.
5. CONCRETE COVER FROM FACE OF CONCRETE TO REINFORCING STEEL SHALL BE 3 INCHES CLEAR, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR PLACING SHALL CONFORM TO THE CONCRETE REINFORCING STEEL INSTITUTE'S RECOMMENDED PRACTICE FOR PLACING REINFORCING STEEL.
7. REINFORCING BARS SHALL BE DETAILED IN ACCORDANCE WITH THE LATEST ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES (ACI 315).
8. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/4" X 45 DEGREE CHAMFER, UNLESS NOTED OTHERWISE.
9. CARBON STEEL ELEMENTS SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 OR A153, AS APPLICABLE.
10. AT ALL COLD JOINTS, BOND NEW CONCRETE TO HARDENED CONCRETE WITH ACCEPTED BONDING AGENT. APPLY AS RECOMMENDED BY MANUFACTURER.
11. CONCRETE SHALL NOT BE PLACED WITHIN 100 FEET OF PILE DRIVING OR OTHER OPERATIONS THAT CREATE VIBRATIONS.
12. ALL TOP SURFACES OF DECK CONCRETE SHALL BE BROOM FINISHED.

MARINE FENDER NOTES:

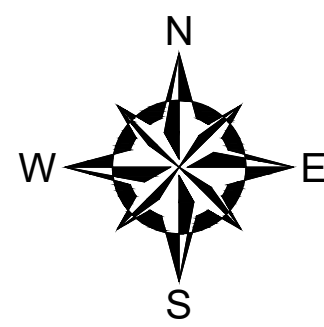
- 1. MARINE FENDERS SHALL CONFORM TO THE REQUIREMENTS OF SECTION 35 59 13 AND TO THE REQUIREMENTS LISTED HEREIN AND ELSEWHERE ON THE CONTRACT DRAWINGS.
2. THE MARINE FENDER SYSTEM IS BASED ON THE MOORING AND BERTHING DESIGN CRITERIA FOR THE NATIONAL SECURITY MULTI-MISSION VESSEL (NSMV) AND THE SPECIFIC NSMV HULL PRESSURES.



I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

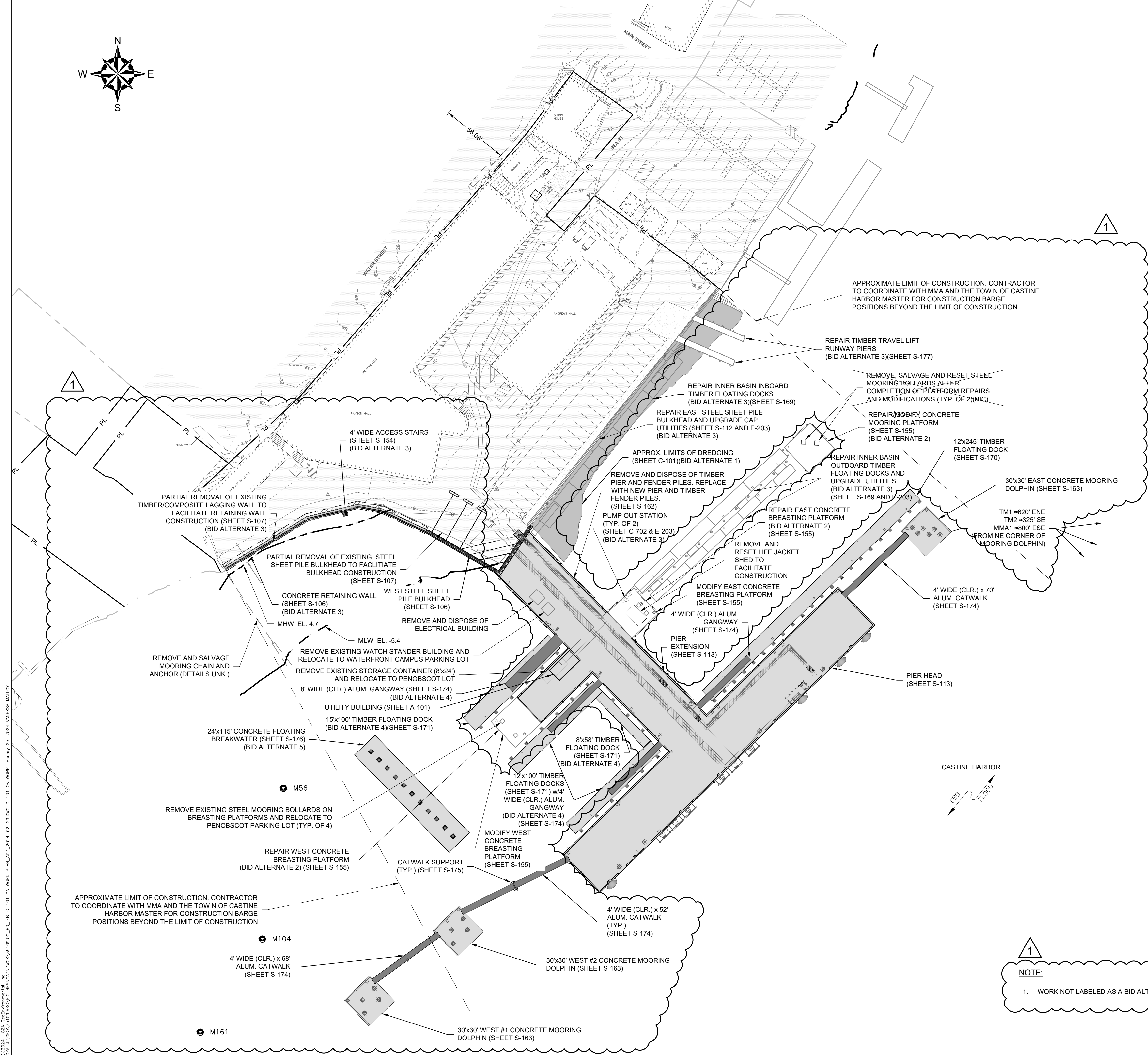
Table with 4 columns: NO., ISSUE/DESCRIPTION, DDF, DATE. Includes addendum #7 information and project details for MAINE MARITIME ACADEMY WATERFRONT CAMPUS.

© 2024 - GZA GeoEnvironmental, Inc. GZA is a U.S. Equal Opportunity Employer. MAINE MARITIME ACADEMY WATERFRONT IMPROVEMENTS, CASTINE, MAINE. 35109.00. SHEET 4 OF 142.



LEGEND:

DESCRIPTION	EXISTING
USC&GS BENCHMARK	
SURVEY STATION SIGN	
PROPERTY LINE	
APPROXIMATE EXTERIOR PROPERTY LINE	
FLOOD LINE	
MEAN HIGH WATER LINE (MHW)	
MEAN LOW WATER LINE (MLW)	
EDGE OF PAVEMENT	
EDGE OF GRAVEL	
FENCE	
MINOR FOOT CONTOUR	
MAJOR FOOT CONTOUR	
TREELINE	
BATHYMETRY MINOR FOOT CONTOUR	
BATHYMETRY MAJOR FOOT CONTOUR	
STEEL PIPE PILE	
TIMBER PILE	
STEEL H-PILE	
MOORINGS	
STEAM LINE	
FORCE MAIN	
WATER LINE	
FIRE MAIN	
UNDERGROUND COMMUNICATIONS	
UNDERGROUND ELECTRICAL	
UNDERGROUND UTILITY	
COMMUNICATION MANHOLE	
ELECTRICAL MANHOLE	
LIGHT POLE	
FIRE AND SAFETY PEDESTAL	
PUMP OUT STATION	
POWER PEDESTAL	
100-TON SINGLE BITT BOLLARD	
CLEAT	
EQUIPMENT SAFETY BOLLARD	
JUNCTION BOX FIXTURE	

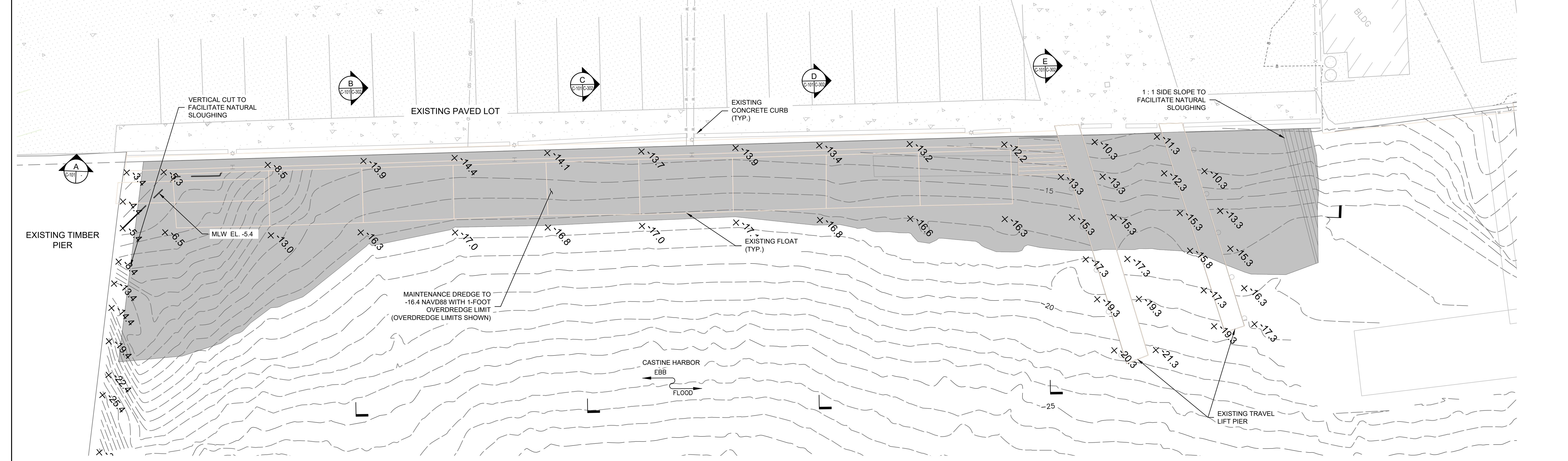


I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

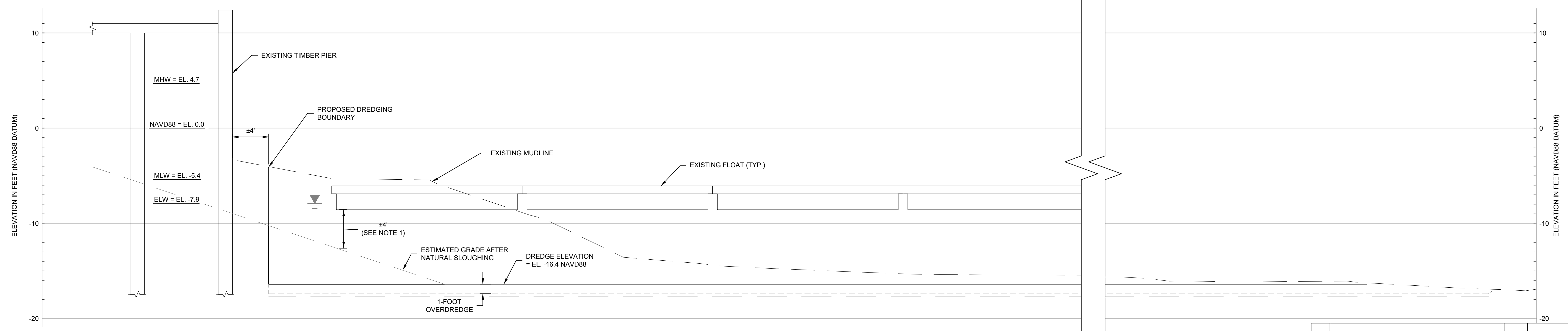
NOTE:
1. WORK NOT LABELED AS A BID ALTERNATE IS PART OF THE BASE BID.

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEODESIGN/INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSMITTED, REPRODUCED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
OVERALL WORK PLAN			
PREPARED BY: 		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	PROJECT NO: 35109.00	DRAWN BY: MEA	SCALE: AS NOTED
			REVISION NO:
			DRAWING G-101 SHEET NO. 7 OF 142

© 2024 GZA Geospatial, Inc. GZA-GeoEnvironmental, Inc. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSMITTED, REPRODUCED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.



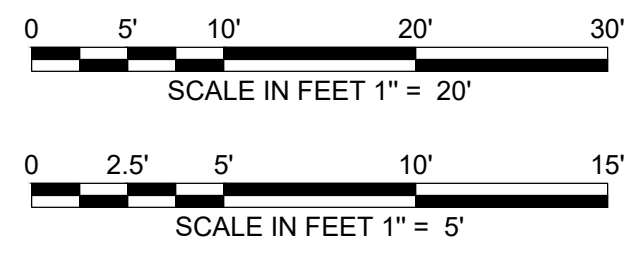
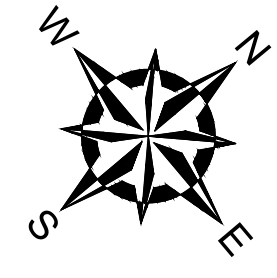
A DREDGE PLAN
SCALE: 1" = 10'



A DREDGE SECTION A - A'
SCALE: 1" = 5'

- NOTES**
- ESTIMATED UNDER FLOAT CLEARANCE POST-DREDGE. CONTRACTOR TO CONFIRM AND NOTIFY ENGINEER PRIOR TO DEMOBILIZING DREDGE EQUIPMENT.

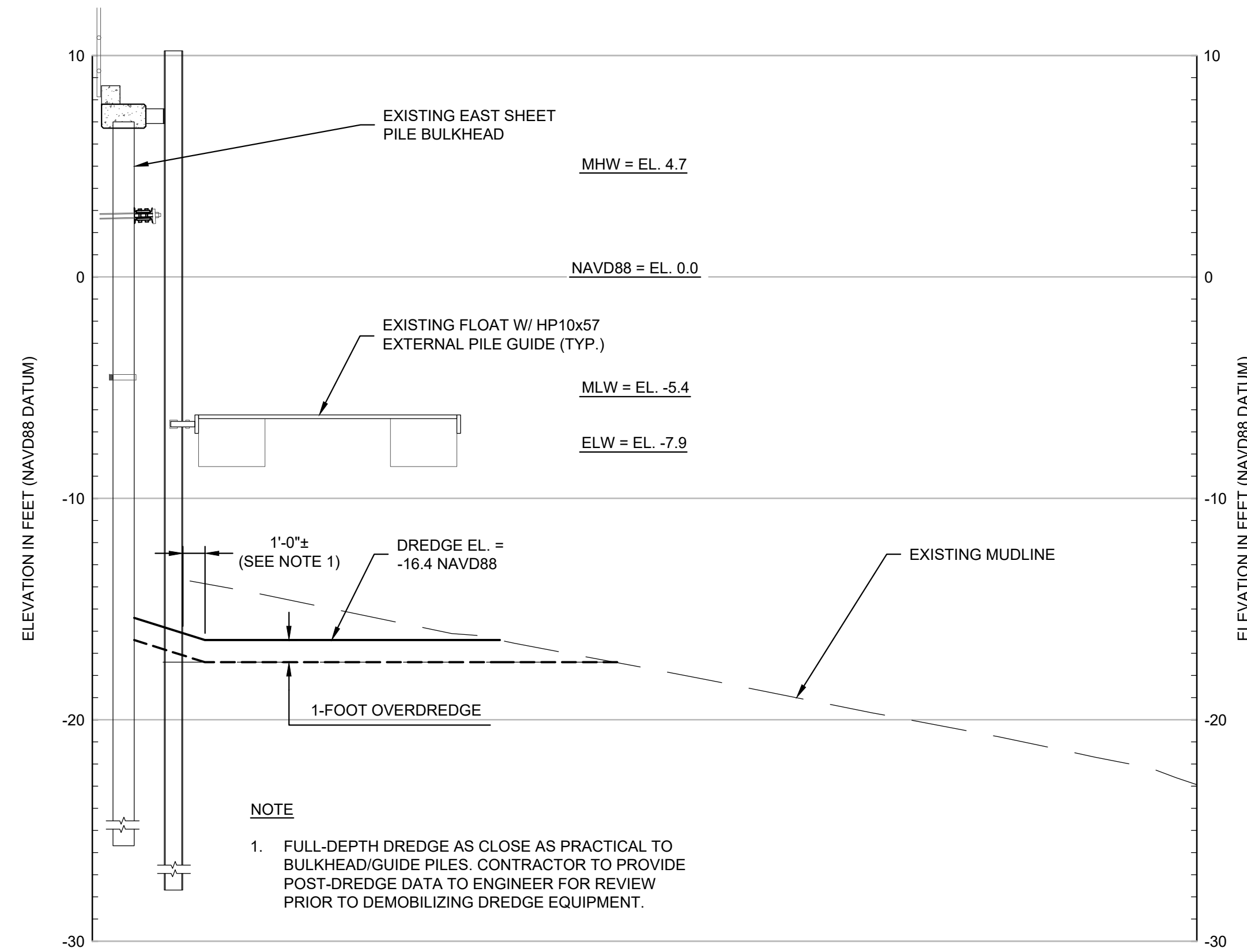
I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024



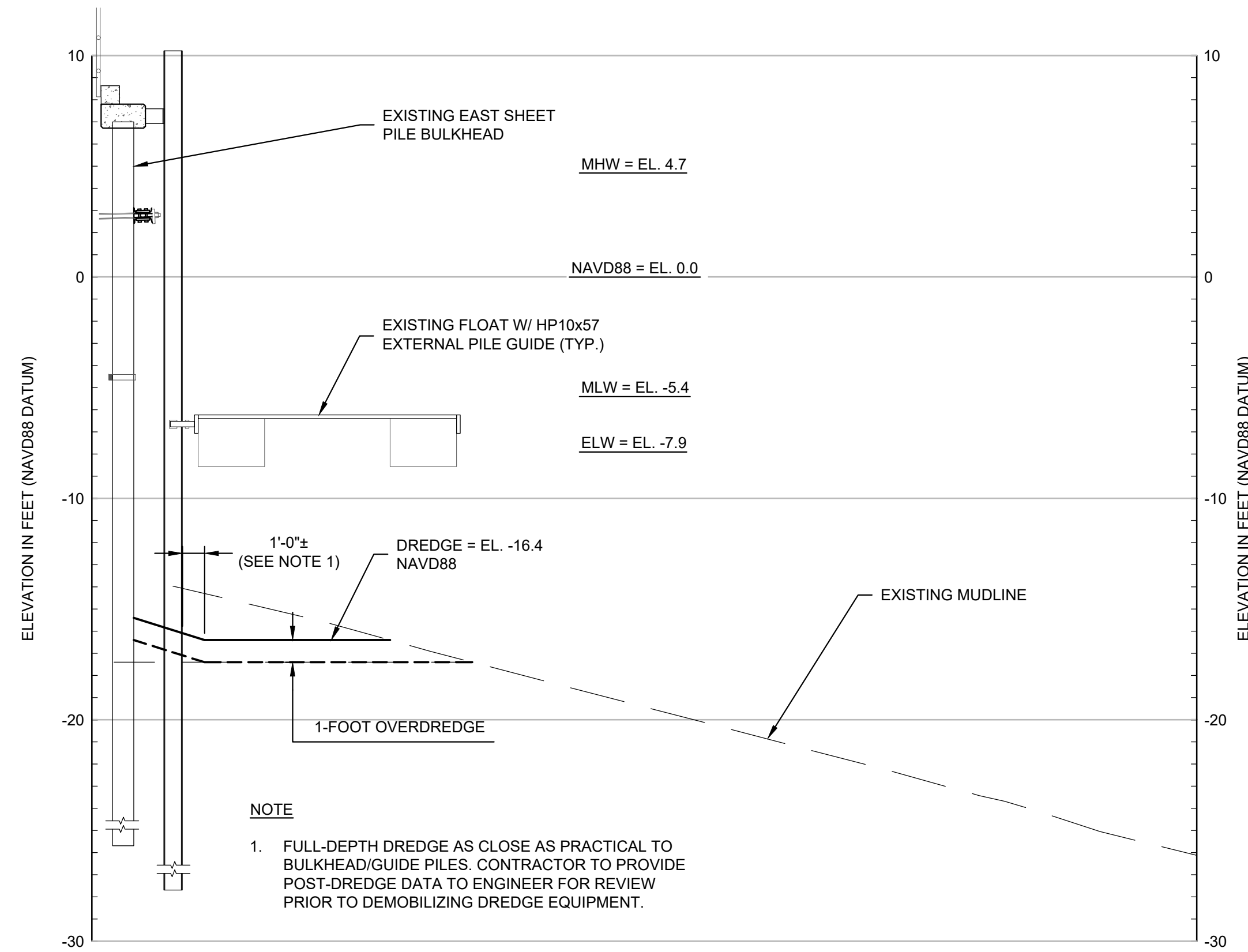
- NOTES**
- BATHYMETRIC CONTOURS SHOWN BENEATH FLOATING DOCKS AND TRAVEL LIFT PIERS WERE GENERATED FROM SOUNDING DATA COLLECTION BY GZA. SEE B-101 FOR SOUNDING ELEVATIONS AND LOCATIONS.

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THIS DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
DREDGE PLAN AND SECTION BID ALTERNATE 1			
PREPARED BY GZA Geotechnical, Inc. Engineers and Scientists www.gza.com		PREPARED FOR MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	DESIGNED BY: EJV	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	DRAWN BY: EJV	PROJECT NO.: 35109.00	SCALE: AS NOTED
			DRAWING C-101 SHEET NO. 23 OF 142

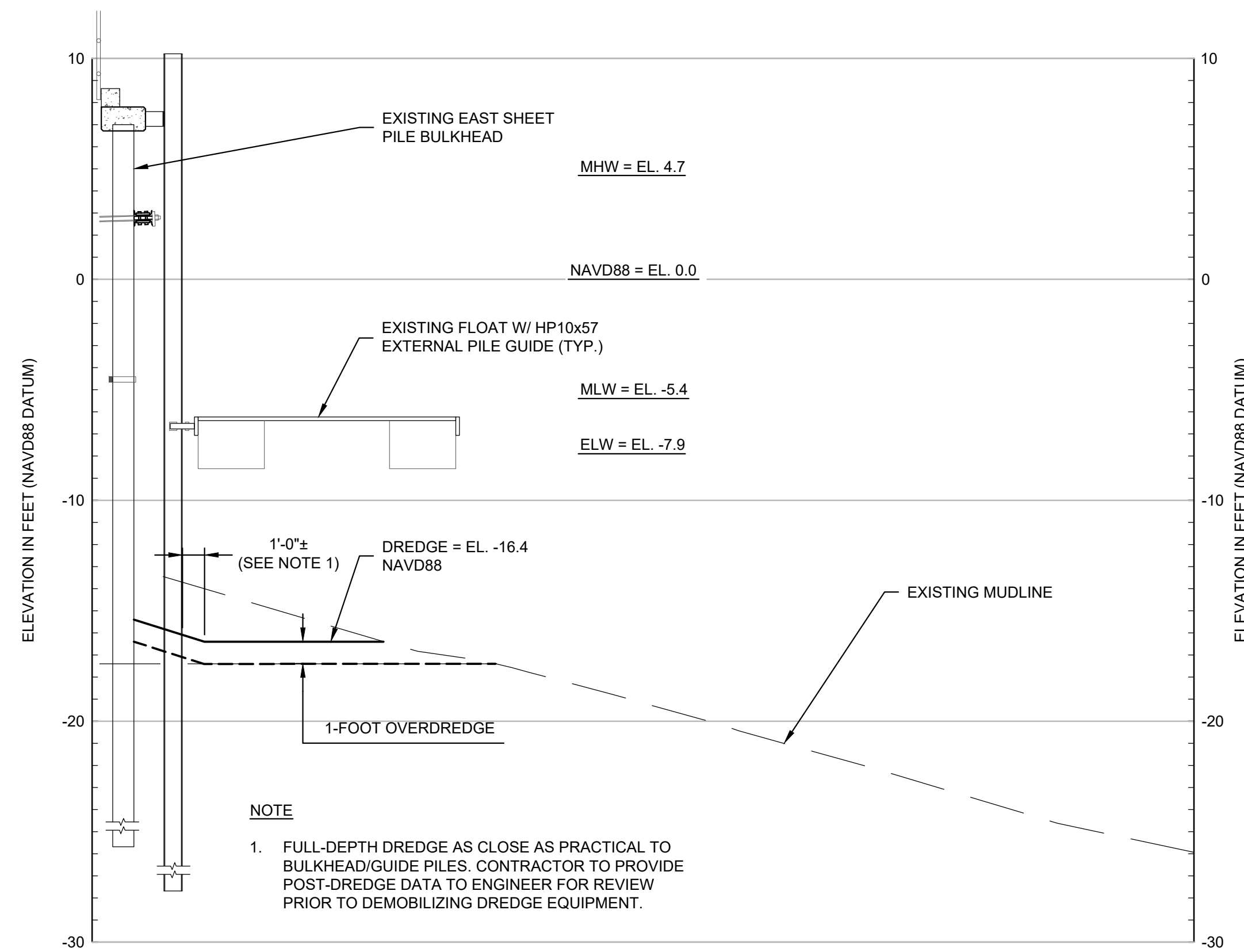
© 2024 GZA Geotechnical, Inc. DREDGE PLAN AND SECTION A-A' SCALE: 1" = 5' DATE: JANUARY 26, 2024. WAINES, MALLOY



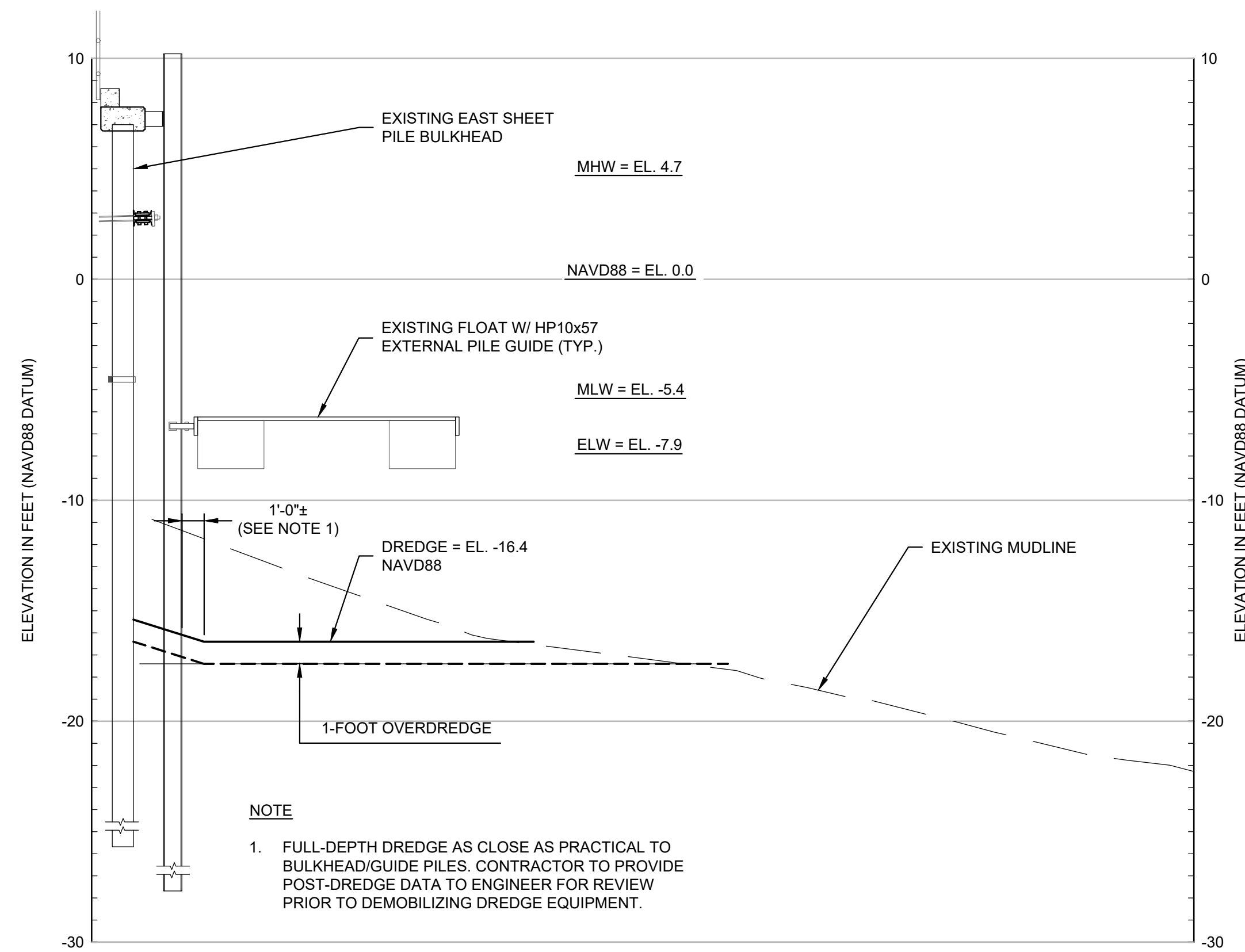
B DREDGE SECTION
C-101/C-302 SCALE: 1" = 5'



C DREDGE SECTION
C-101/C-302 SCALE: 1" = 5'



D DREDGE SECTION
C-101/C-302 SCALE: 1" = 5'



E DREDGE SECTION
C-101/C-302 SCALE: 1" = 5'



I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
1			

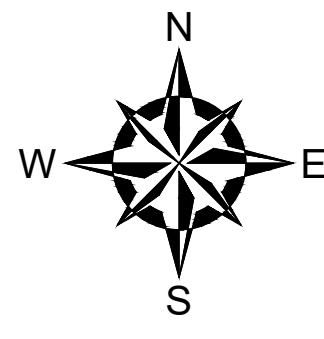
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THIS DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THIS DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE

**DREDGE SECTIONS
BID ALTERNATE 1**

PREPARED BY: 	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME		
PROJ MGR: RKC	REVIEWED BY: CWC	CHECKED BY: DDF	DRAWING NO.: C-302
DESIGNED BY: EJW	DRAWN BY: MEA	SCALE: AS NOTED	PROJECT NO.: 35109.00
DATE: JANUARY 2024	PROJECT NO.: 35109.00	REVISION NO.:	SHEET NO. 27 OF 142

© 2024 - GZA Geotechnical, Inc. GZA-MAINE-SECTS_A01_2024-10-29.DWG C-302 DREDGE SECTIONS March 29, 2024 VANESSA MALLOY
GZA is an Equal Opportunity Employer. Minorities and women are encouraged to apply.

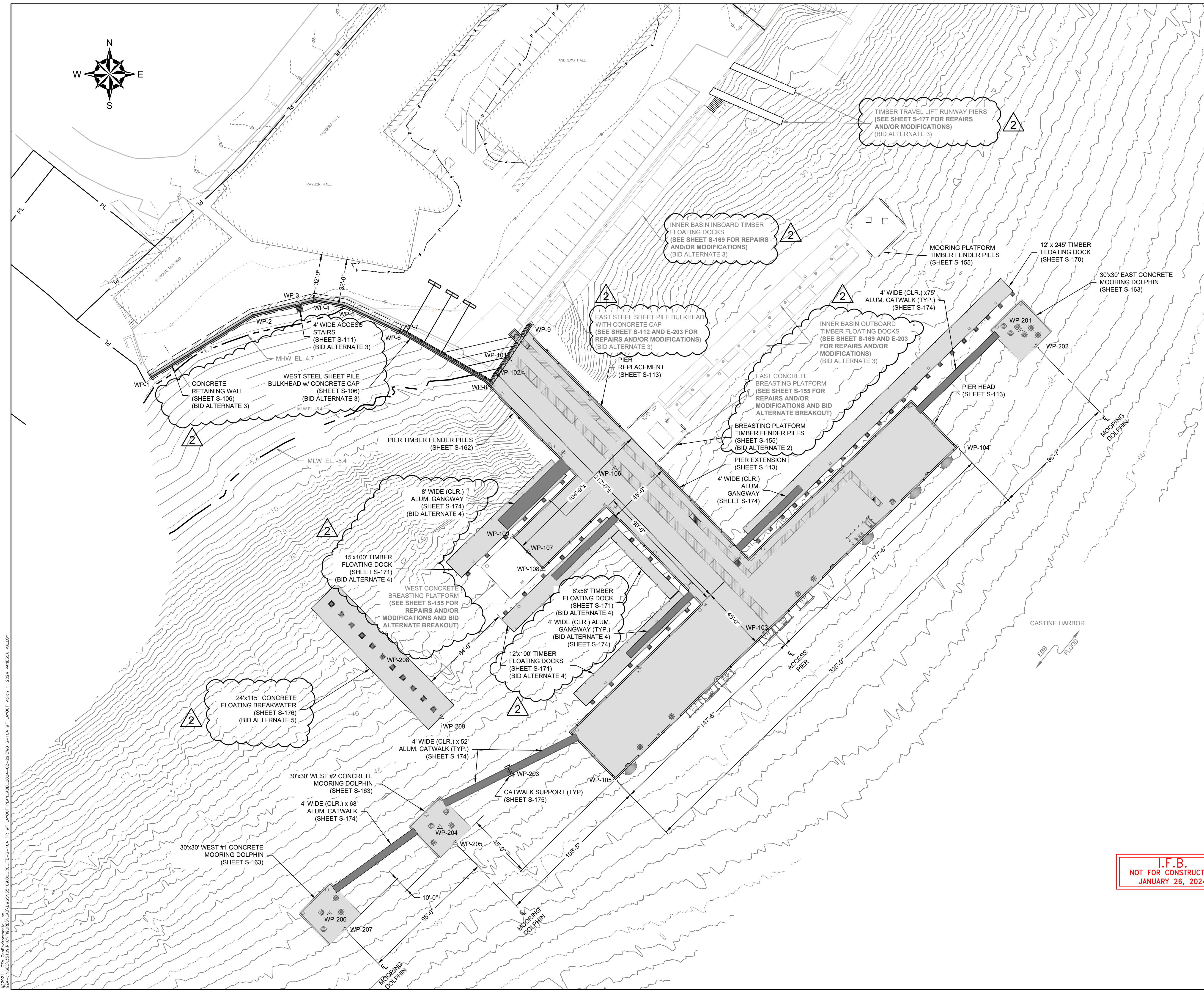


LEGEND:

DESCRIPTION	EXISTING
LAYOUT WORKING POINT	△ WP-1

LAYOUT POINT COORDINATES

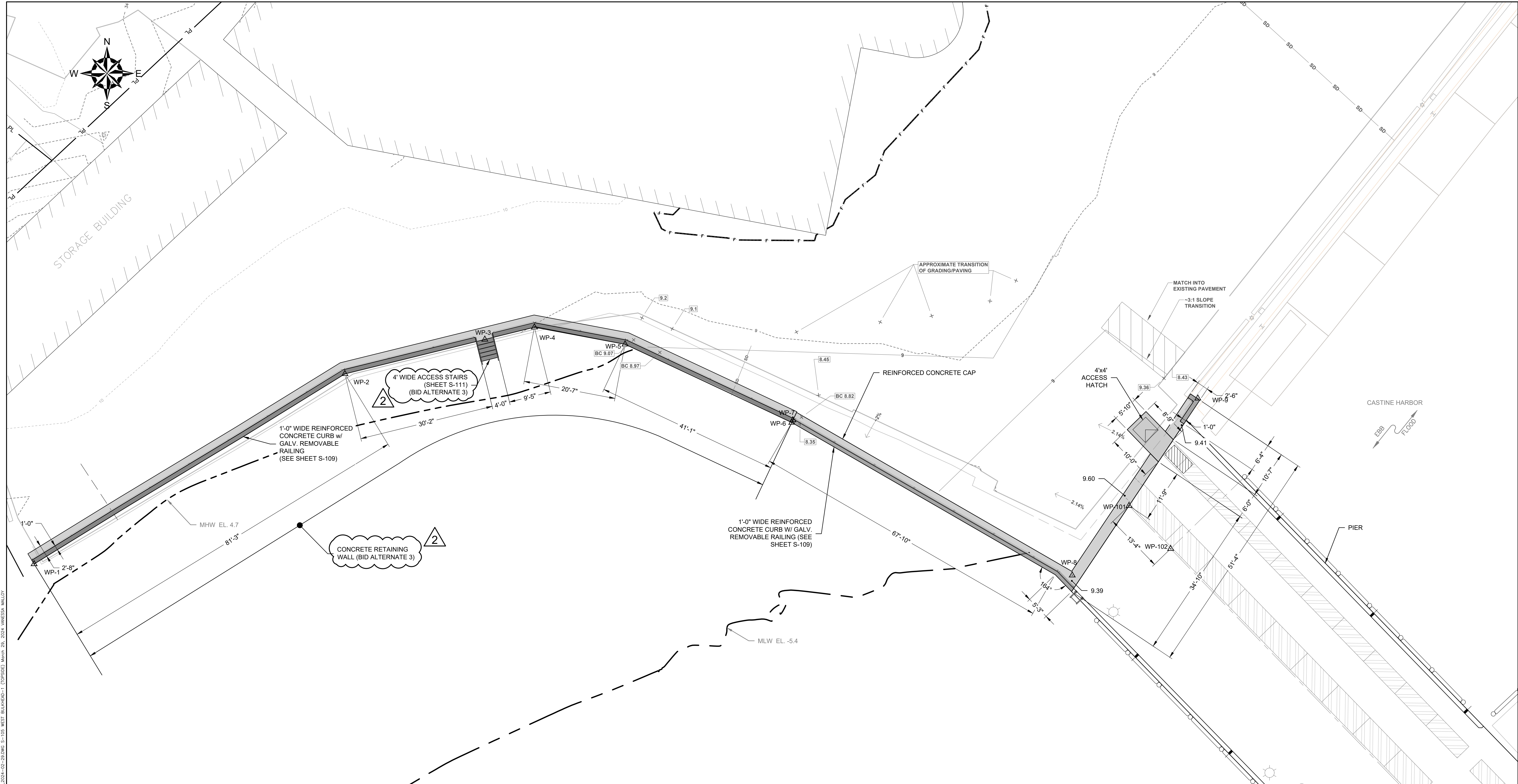
POINT I.D.	EASTING	NORTHING	LOCATION DESCRIPTION
WP-1	906476.054	262511.801	TOP CORNER OF RETAINING WALL
WP-2	906476.349	262554.167	BEND IN RETAINING WALL
WP-3	906507.544	262561.855	CENTERLINE OF ACCESS STAIRS
WP-4	906518.595	262564.579	BEND IN RETAINING WALL
WP-5	906538.814	262560.773	BEND IN RETAINING WALL
WP-6	906575.985	262543.322	TOP CORNER OF RETAINING WALL
WP-7	906576.233	262543.839	INTERLOCK OF STEEL SHEETPILE
WP-8	906638.490	262509.284	CORNER OF SHEETPILE BULKHEAD
WP-9	906666.510	262548.722	INTERLOCK OF STEEL SHEETPILE
WP-101	906651.158	262524.769	CENTERLINE OF PIER REPLACEMENT
WP-102	906660.444	262515.201	CENTER OF PILE CAP "BENT B"
WP-103	906829.308	262341.195	CENTERLINE OF PIER EXTENSION
WP-104	906956.687	262464.810	NORTHEAST CORNER OF PIER HEAD
WP-105	906723.457	262238.472	SOUTHWEST CORNER OF PIER HEAD
WP-106	906723.165	262450.570	CENTERLINE OF PILE CAP H
WP-107	906664.123	262393.284	CENTERLINE OF PILE CAP H
WP-108	906674.044	262382.008	SOUTHWEST CORNER OF BREASTING PLATFORM
WP-109	906653.547	262403.914	NORTHEAST CORNER OF BREASTING PLATFORM
WP-201	907000.020	262544.485	CENTERPOINT OF EAST MOORING DOLPHIN
WP-202	90710.466	262533.721	CENTERLINE OF EAST MOORING DOLPHIN
WP-203	906651.279	262244.401	CENTERPOINT OF CATWALK SUPPORT
WP-204	906603.870	262206.027	CENTERPOINT OF WEST #2 MOORING DOLPHIN
WP-205	906614.316	262195.262	CENTERLINE OF WEST #2 MOORING DOLPHIN
WP-206	906528.730	262147.043	CENTERPOINT OF WEST #1 MOORING DOLPHIN
WP-207	906539.177	262136.278	CENTERLINE OF WEST #1 MOORING DOLPHIN
WP-208	906564.709	262322.244	CENTERPOINT OF FLOATING BREAKWATER
WP-209	906604.726	262280.954	CENTERLINE OF FLOATING BREAKWATER



**I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024**

2		ADDENDUM #7		DDF	3/29/2024
1		ADDENDUM #3		DDF	3/1/2024
NO.	ISSUE/DESCRIPTION			BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA ENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THIS DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THIS DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.					
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE					
WATERFRONT STRUCTURES LAYOUT PLAN					
PREPARED BY:	GZA Environmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR:	MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF	SCALE: AS NOTED	DRAWING S-104 SHEET NO. 33 OF 142
DATE: JANUARY 2024	PROJECT NO. 03.0035109.00	REVISION NO.			

© 2024 GZA Environmental, Inc. GZA-AUT-ADD-2024-02-29.DWG: S-104 WP LAYOUT March 1, 2024 WANESSA MALLOY
GZA is an Equal Opportunity Employer. Minorities and women are encouraged to apply.



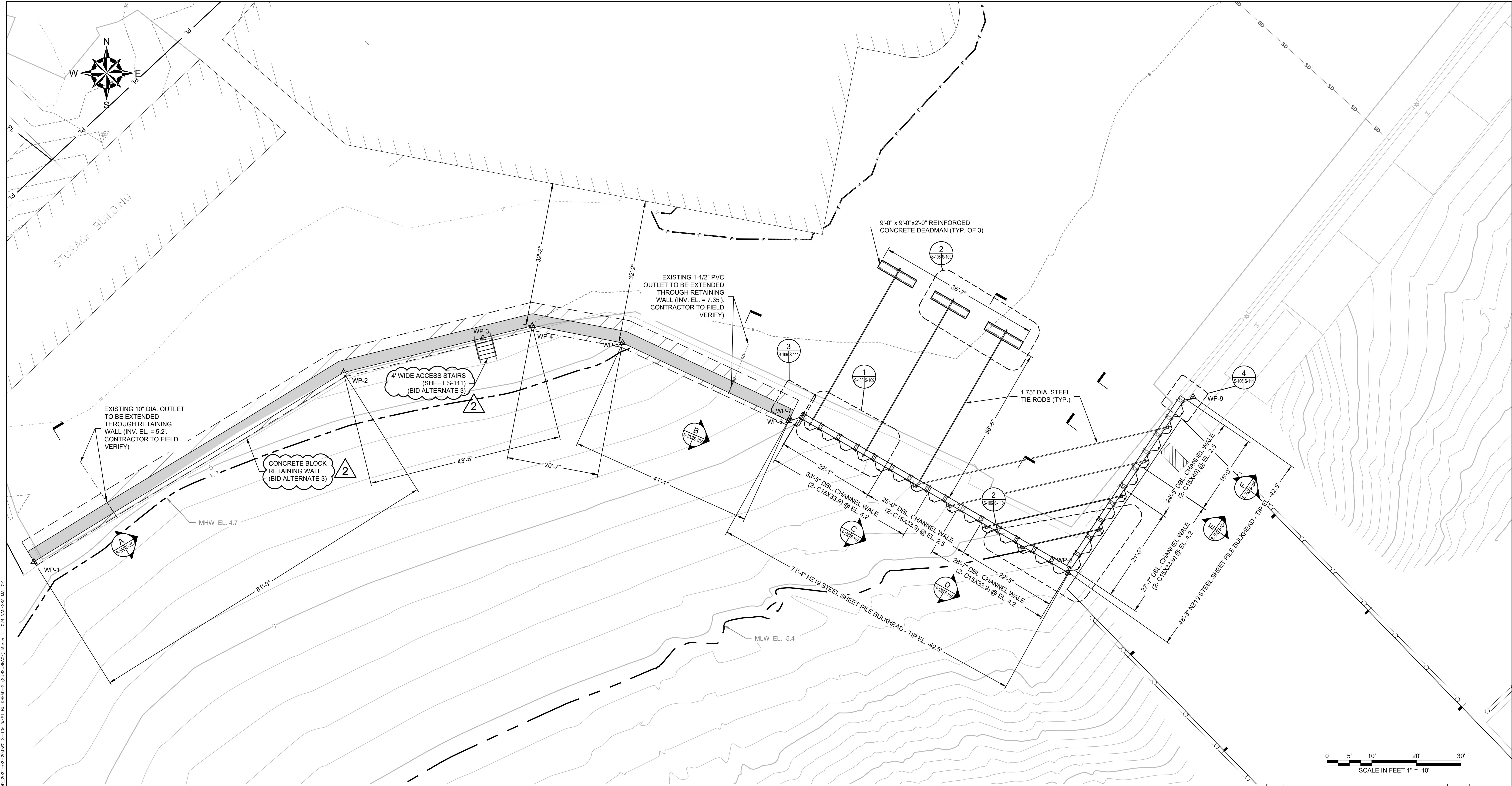
I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

LEGEND:

DESCRIPTION	EXISTING
LAYOUT WORKING POINT	WP-1
PROPOSED SPOT ELEVATION	9.39

2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #3	DDF	3/1/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
WEST BULKHEAD AND RETAINING WALL PLAN -1			
PREPARED BY:	GZA Geotechnical, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	DRAWN BY: MEA	PROJECT NO: 03.0035109.00	SCALE: AS NOTED REVISION NO:
			DRAWING S-105 SHEET NO. 34 OF 142

© 2024 GZA Geotechnical, Inc. GZA-PLA-ADD-2024-102-29.DWG, S-109, WEST BULKHEAD -1 (TOPSIDE) March 29, 2024, WASSISSA MALLOY



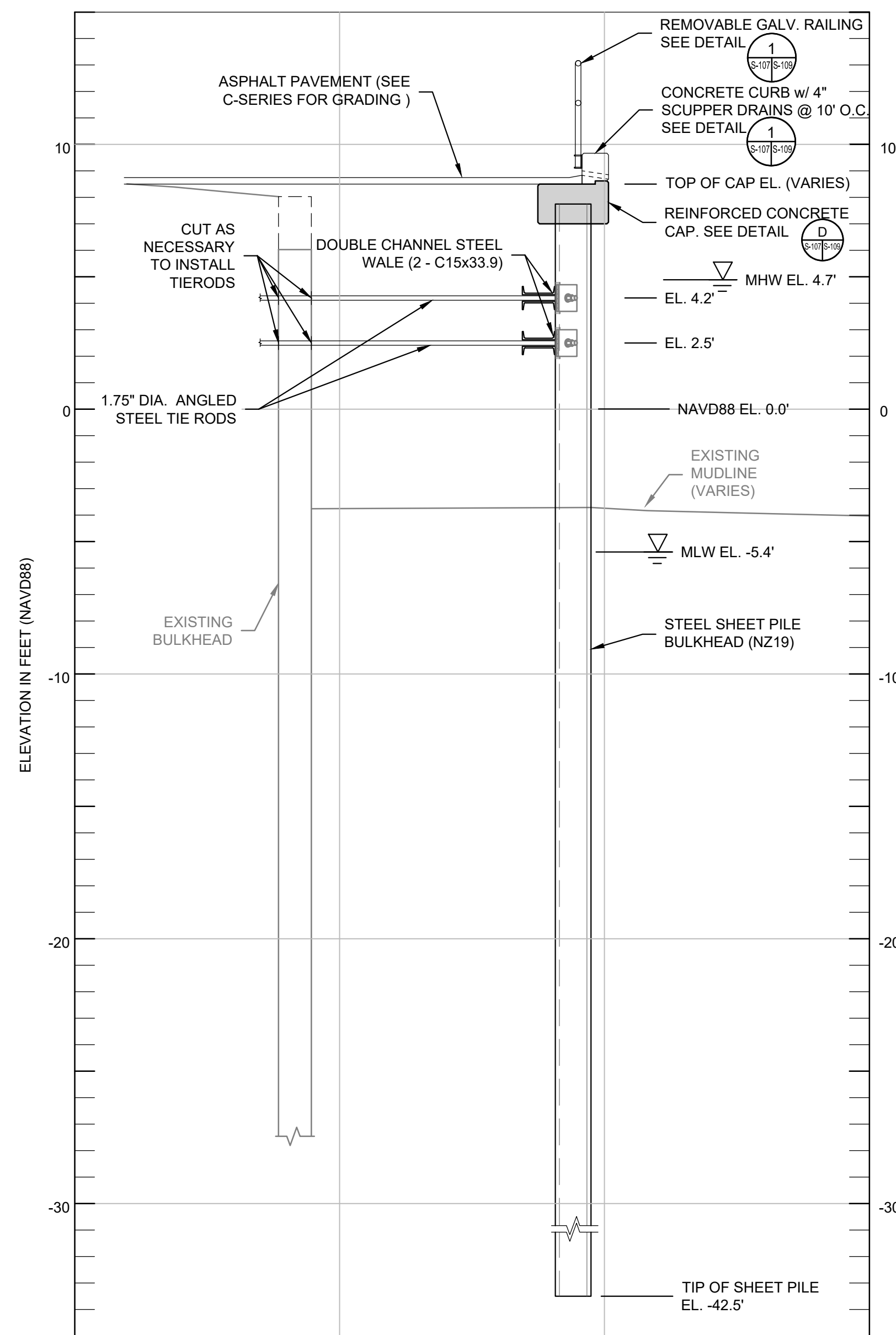
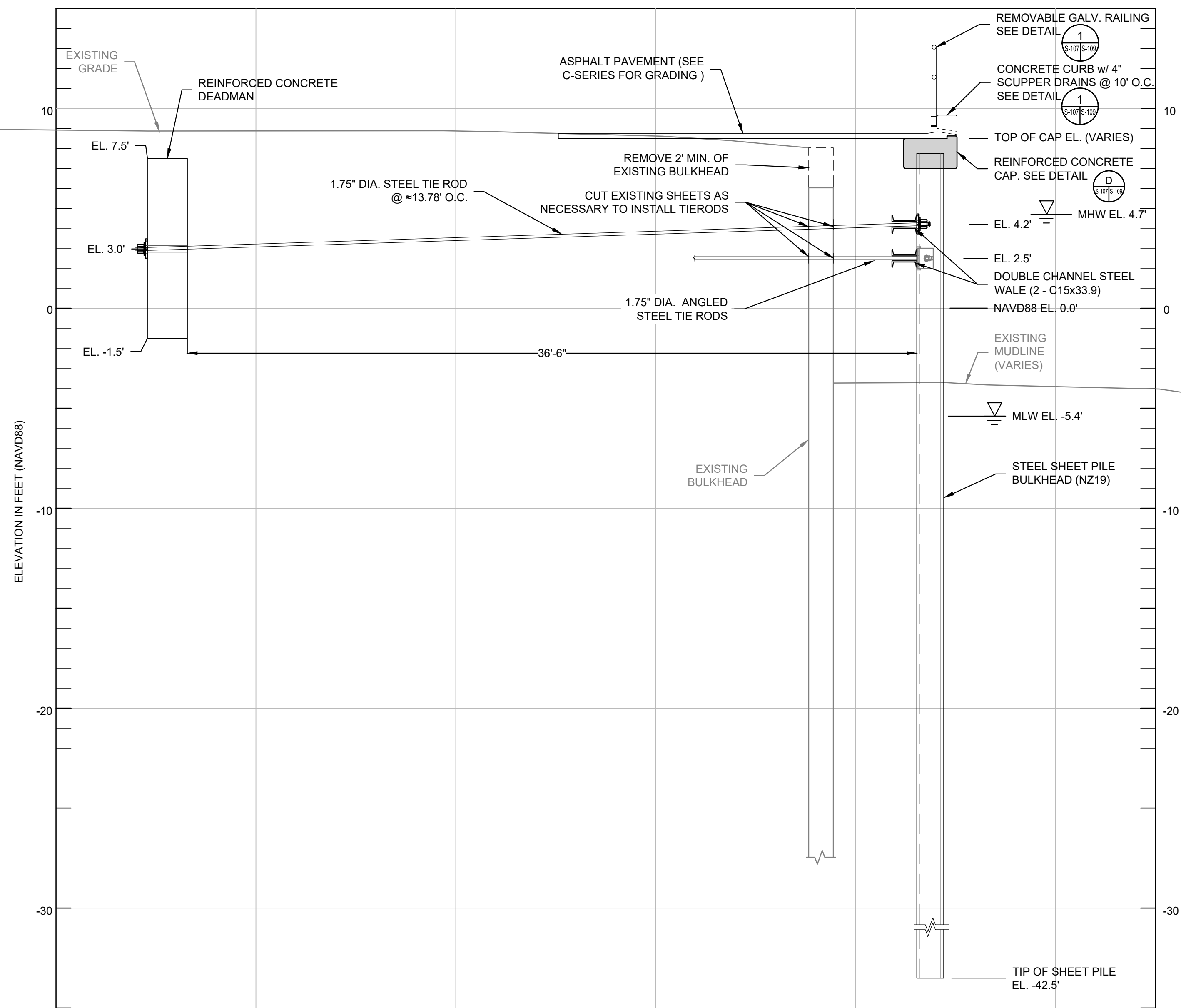
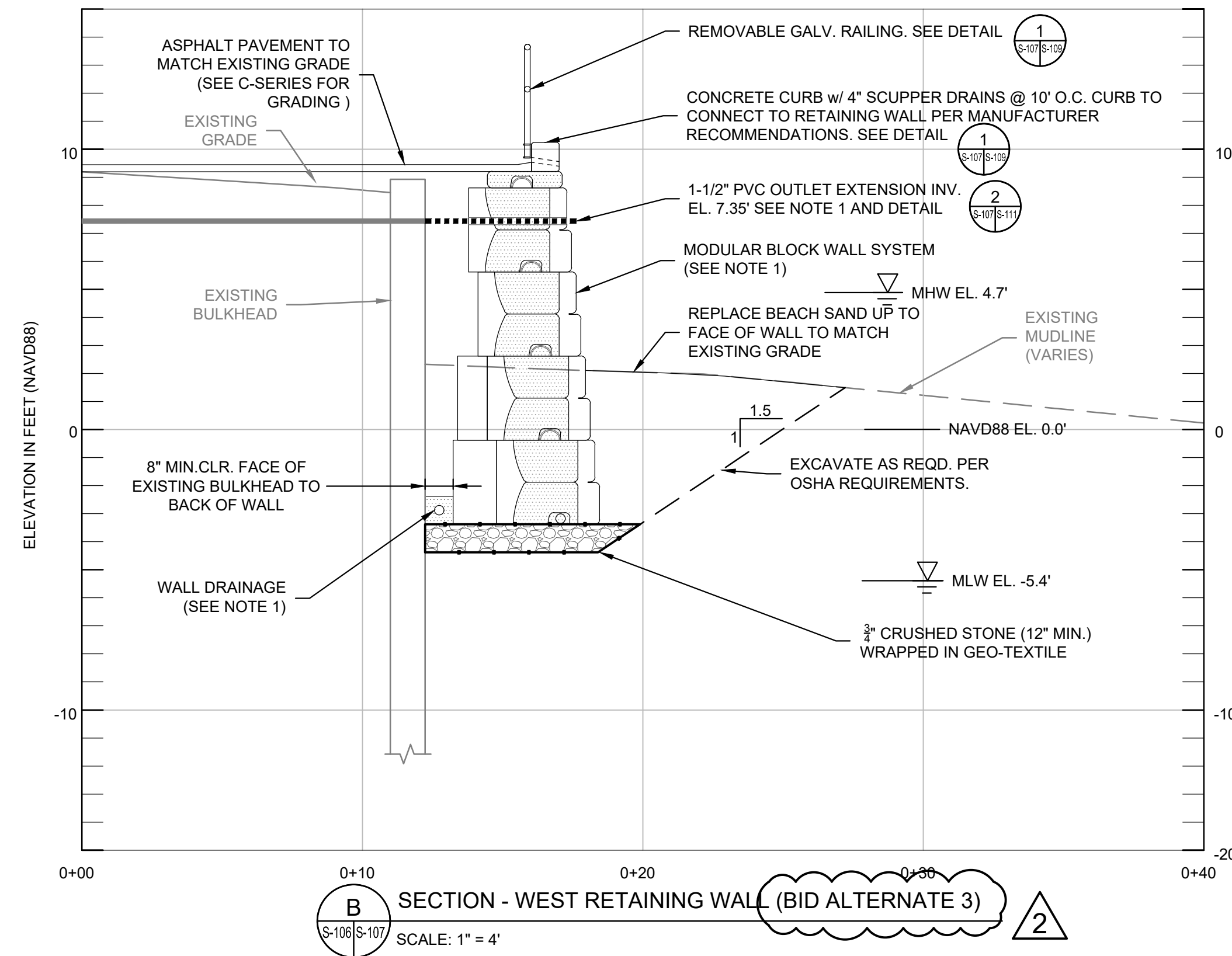
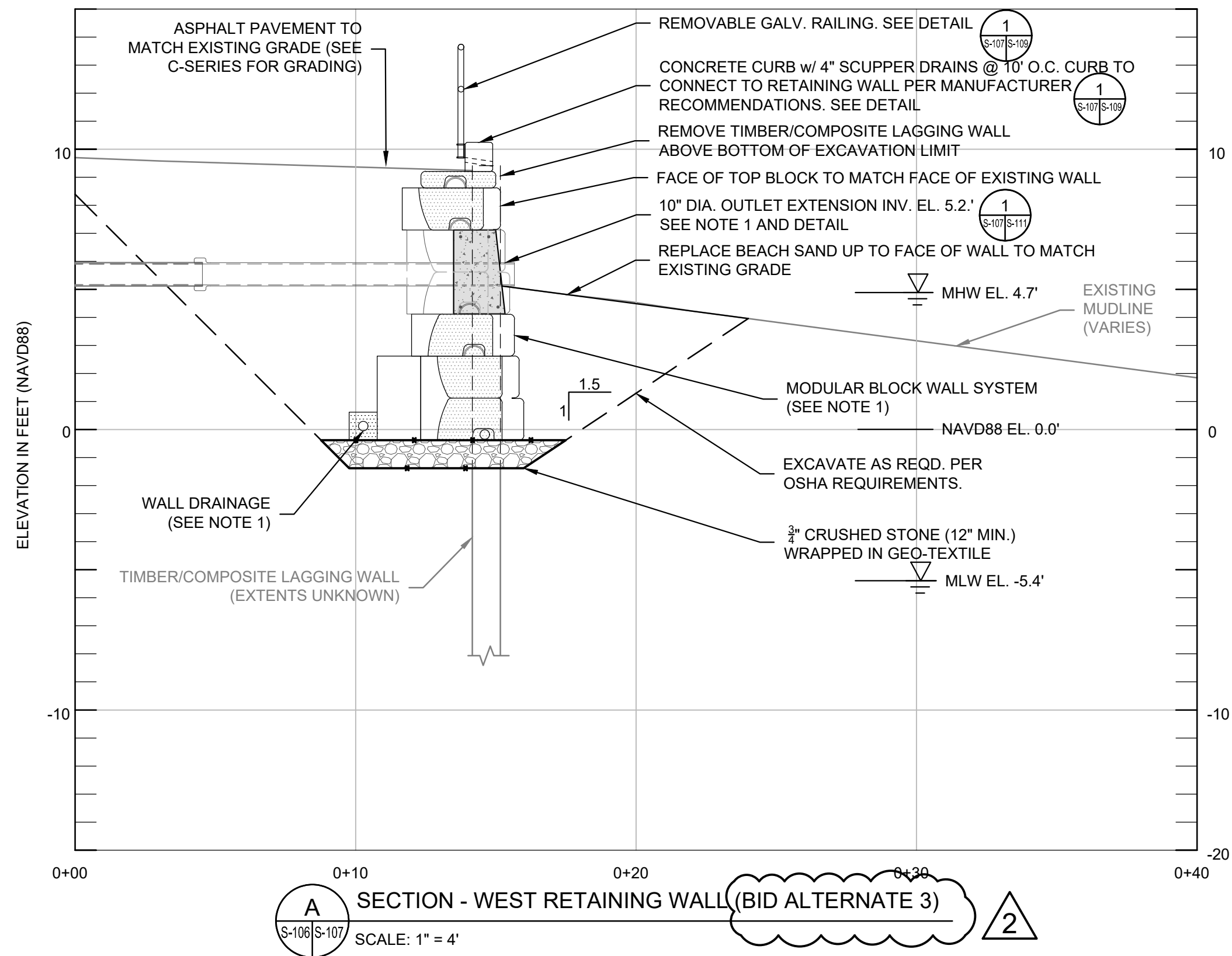
LEGEND:

DESCRIPTION	EXISTING
LAYOUT WORKING POINT	WP-1

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #3	DDF	3/1/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
WEST BULKHEAD AND RETAINING WALL PLAN - 2			
PREPARED BY: GZA Geotechnical, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC DESIGNED BY: AFS DATE: JANUARY 2024	REVIEWED BY: CWC DRAWN BY: MEA PROJECT NO.: 03.0035109.00	CHECKED BY: DDF SCALE: AS NOTED REVISION NO.:	DRAWING S-106 SHEET NO. 35 OF 142

© 2024 GZA Geotechnical, Inc. BULKHEAD PLAN_ADD_2024-10-29.DWG S-106 WEST BULKHEAD-2 (SUBSURFACE) March 1, 2024 VANESSA WALLBY
 GZA is an Equal Opportunity Employer. Minorities and women are encouraged to apply.



- NOTES:**
- MODULAR BLOCK WALL SYSTEM SHOWN IS SCHEMATIC AND DOES NOT REPRESENT FINAL CONDITIONS. WALL SHALL BE CONSTRUCTED PER THE PROJECT SPECIFICATIONS AND MANUFACTURER RECOMMENDATIONS.

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024



NO.	ISSUE/DESCRIPTION	BY	DATE
2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #3	DDF	3/1/2024

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

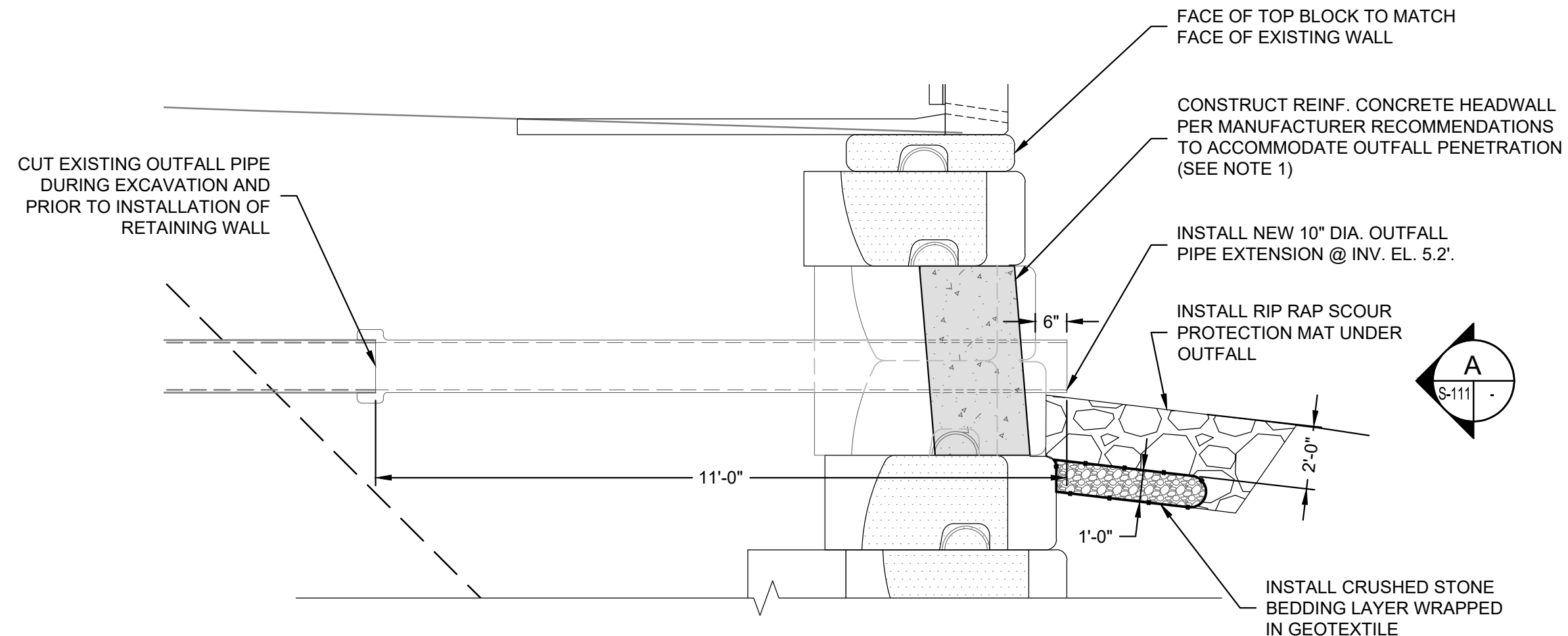
**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE**

WEST BULKHEAD AND RETAINING WALL SECTIONS - 1

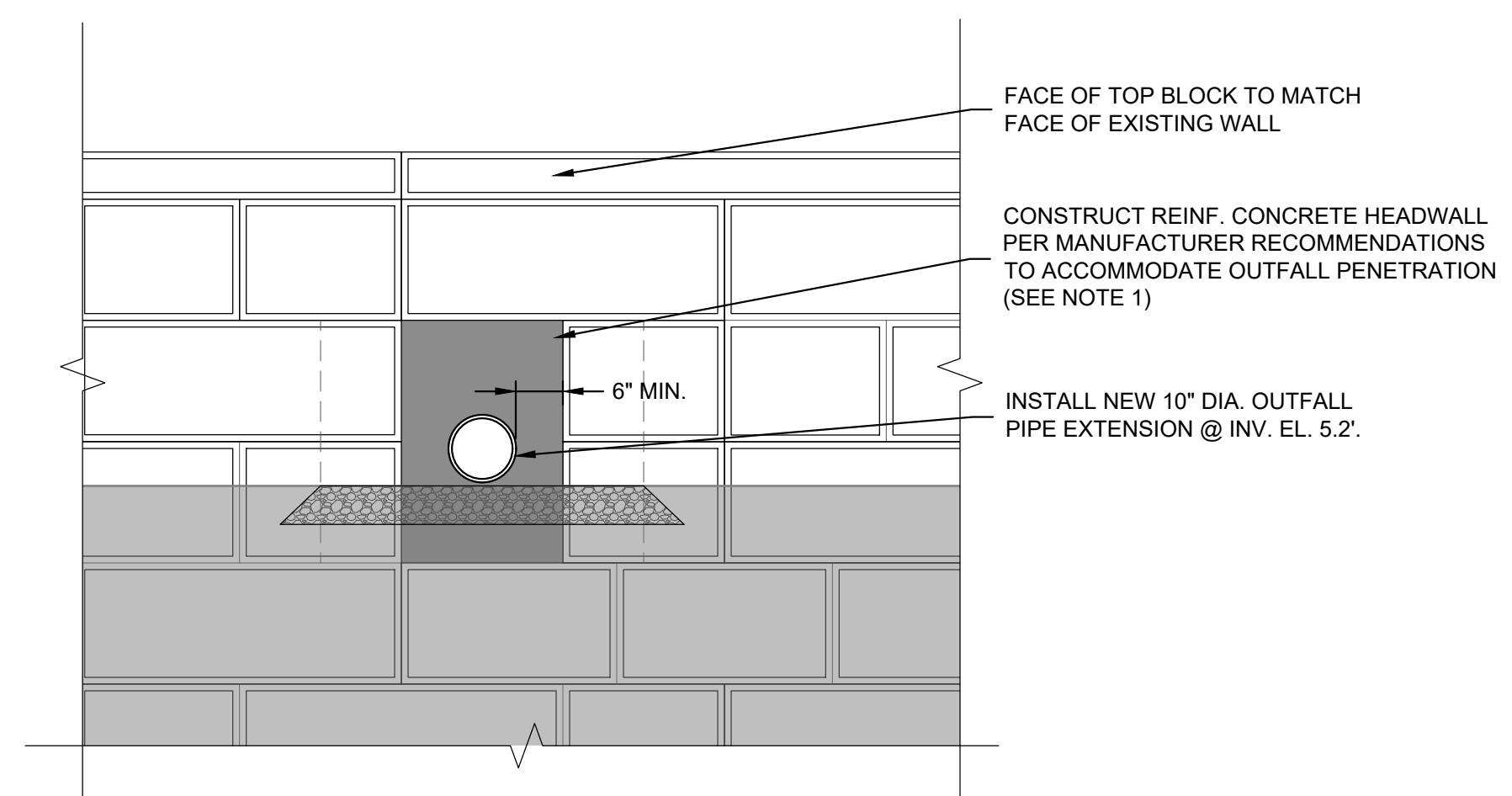
PREPARED BY: GZA GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: AFS DATE: JANUARY 2024	REVIEWED BY: CWC DRAWN BY: MEA PROJECT NO.: 35109.00
CHECKED BY: DDF SCALE: AS NOTED REVISION NO.:	DRAWING S-107 SHEET NO. 36 OF 142

© 2024 - GZA GeoEnvironmental, Inc. GZA is a registered professional engineering firm in the State of Maine. License No. 10000. GZA is a registered professional engineering firm in the State of Maine. License No. 10000. GZA is a registered professional engineering firm in the State of Maine. License No. 10000.

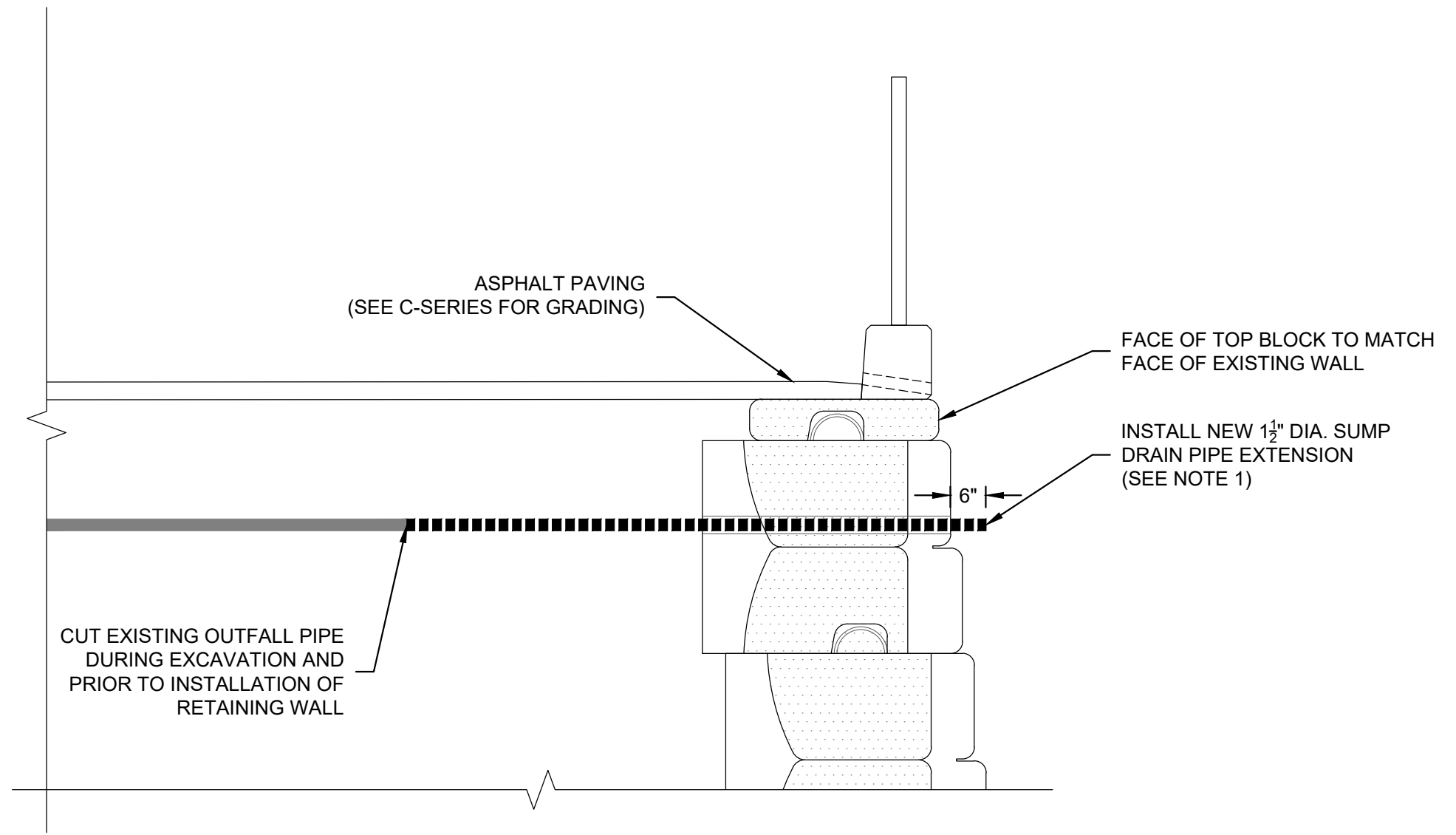
© 2024 - GZA GeoEnvironmental, Inc. GZA-VA-DEED-VA109-0000-VA0100-DC-RC-111-111 PR W BULKHEAD DTLS-3 March 29, 2024 VANESSA WALDY



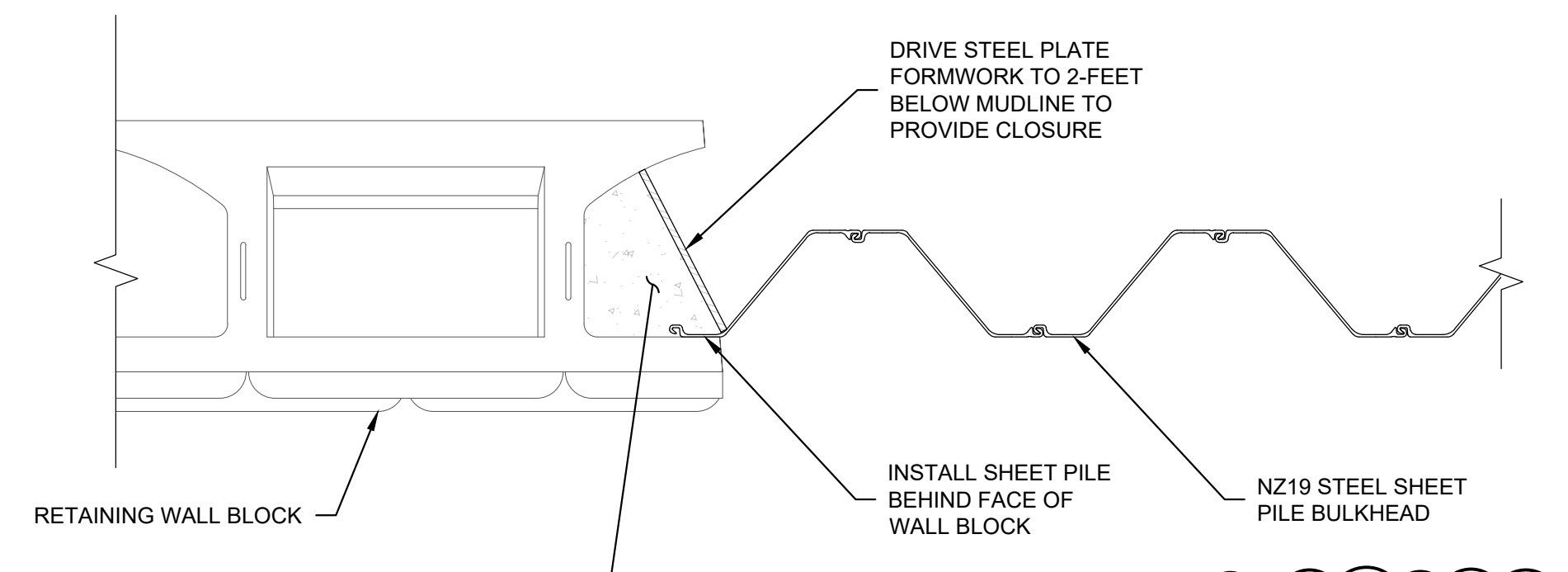
1 DETAIL - RETAINING WALL OUTFALL PENETRATION SCHEMATIC (BID ALTERNATE 3)
 S-107/S-111 SCALE: 1"=2'



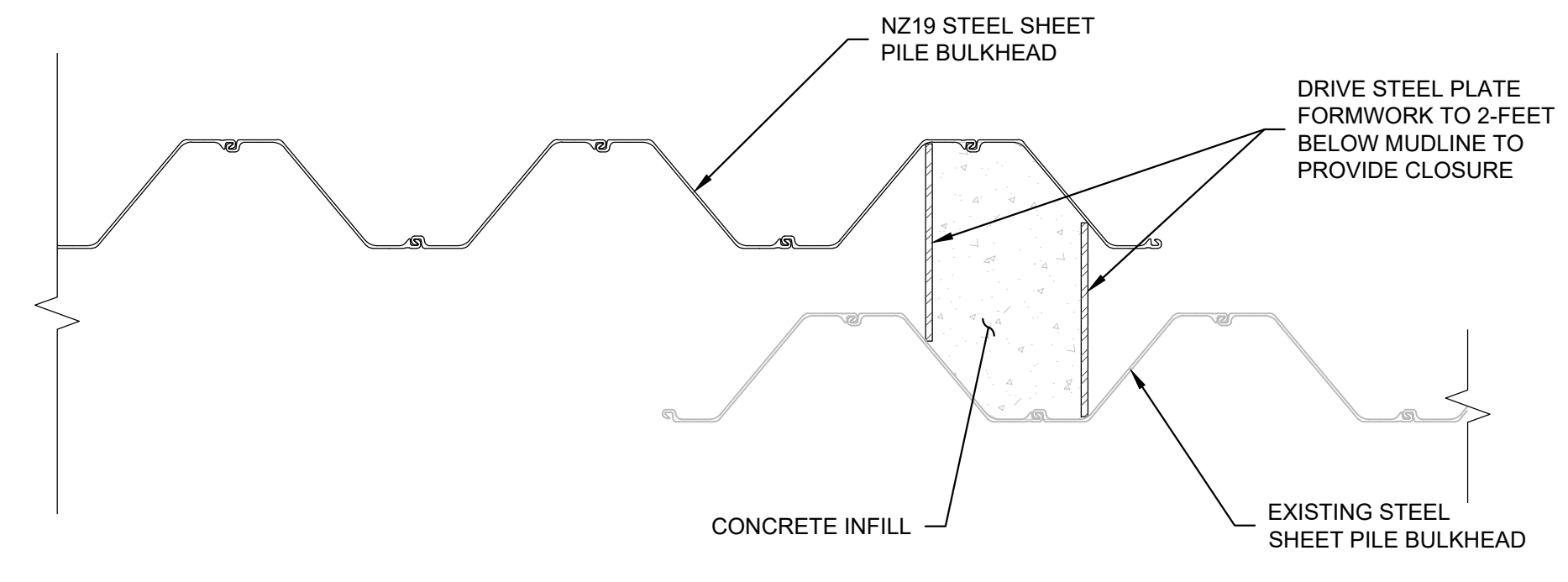
A ELEVATION - RETAINING WALL OUTFALL PENETRATION SCHEMATIC (BID ALTERNATE 3)
 S-111 SCALE: 1"=2'



2 DETAIL - RETAINING WALL DRAIN PIPE PENETRATION SCHEMATIC (BID ALTERNATE 3)
 S-107/S-111 SCALE: 1"=2'



3 DETAIL - RETAINING WALL / SHEET PILE BULKHEAD CLOSURE (BID ALTERNATE 3)
 S-108/S-111 NOT TO SCALE



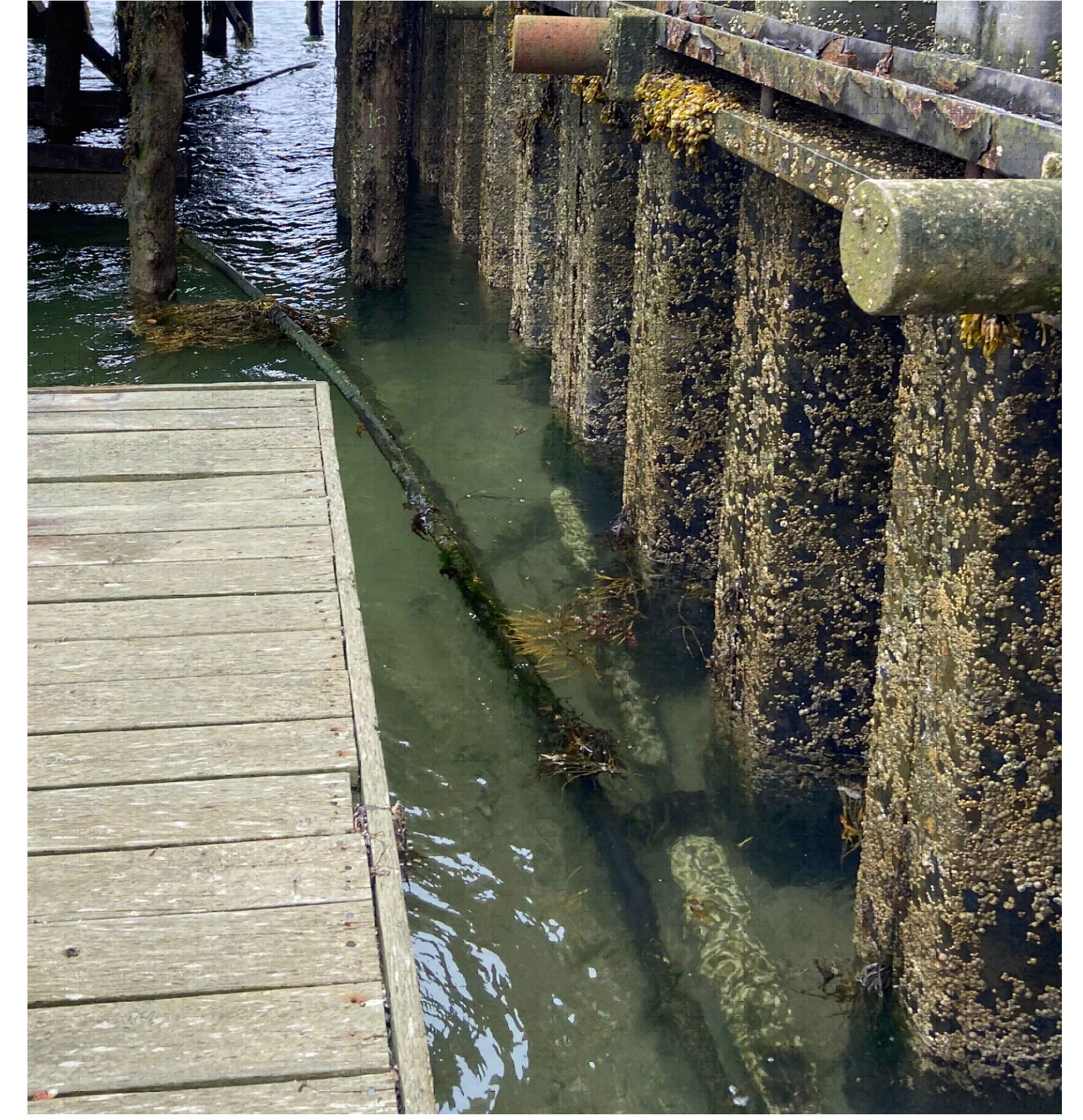
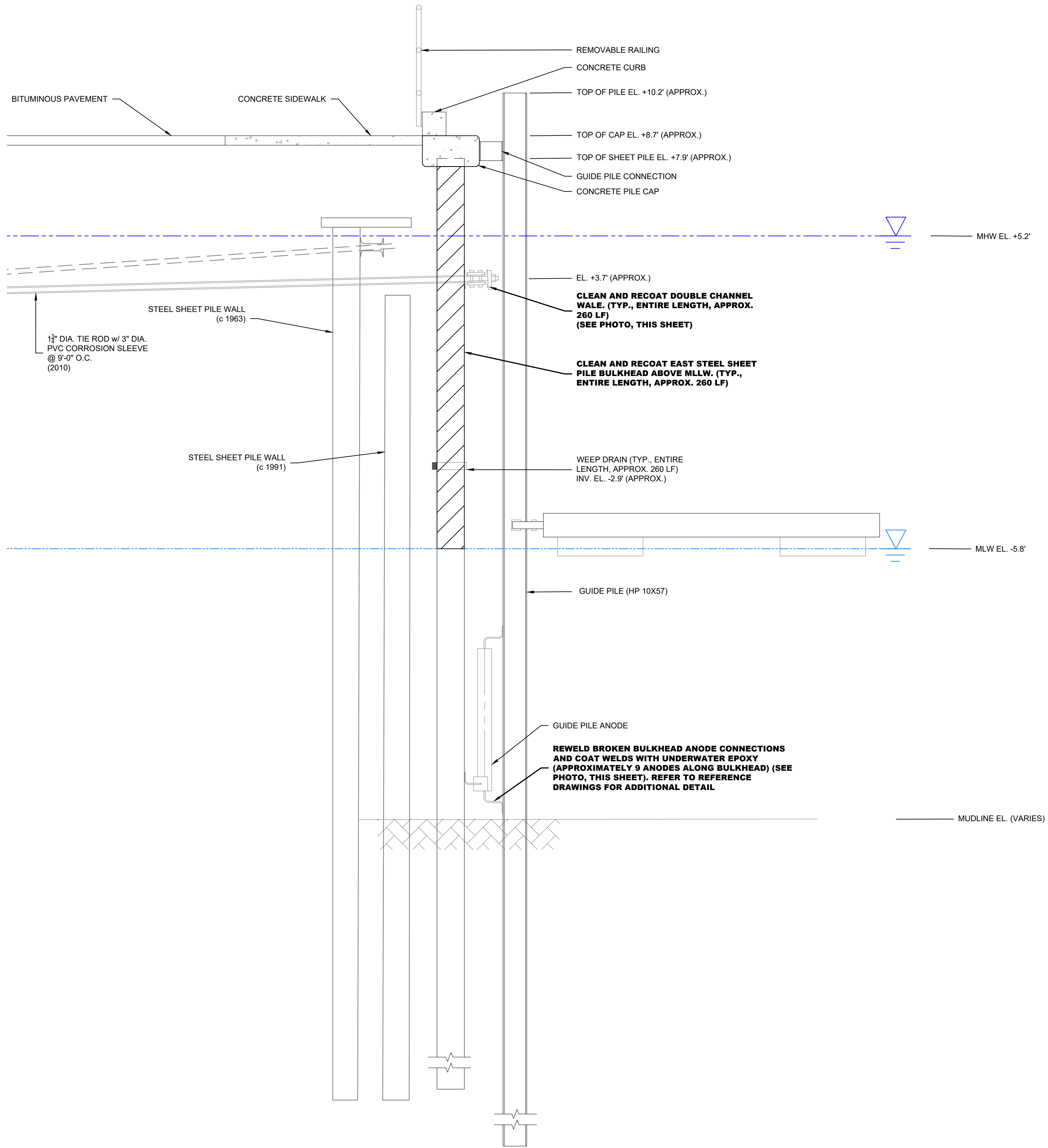
4 DETAIL - SHEET PILE BULKHEAD / EXISTING SHEETPILE CLOSURE
 S-108/S-111 NOT TO SCALE

NOTES:
 1. PENETRATIONS SHOWN THROUGH MODULAR BLOCK WALL SYSTEM ARE SCHEMATIC. THE CONTRACTOR SHALL COORDINATE WITH THE WALL MANUFACTURER TO DETERMINE PROPER METHODS FOR CONSTRUCTING PENETRATIONS THROUGH THE WALL.

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024



NO.	ISSUE/DESCRIPTION	BY	DATE
1	ADDENDUM #7	DDF	3/29/2024
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
WEST BULKHEAD AND RETAINING WALL DETAILS - 3			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	REVIEWED BY: CWC	CHECKED BY: DDF	DRAWING S-111 SHEET NO. 40 OF 142
DESIGNED BY: AFS	DRAWN BY: MEA	SCALE: AS NOTED	
DATE: JANUARY 2024	PROJECT NO. 35109.00	REVISION NO.	



A PHOTO - EXISTING EAST BULKHEAD ANODE LOCATION
 NOT TO SCALE

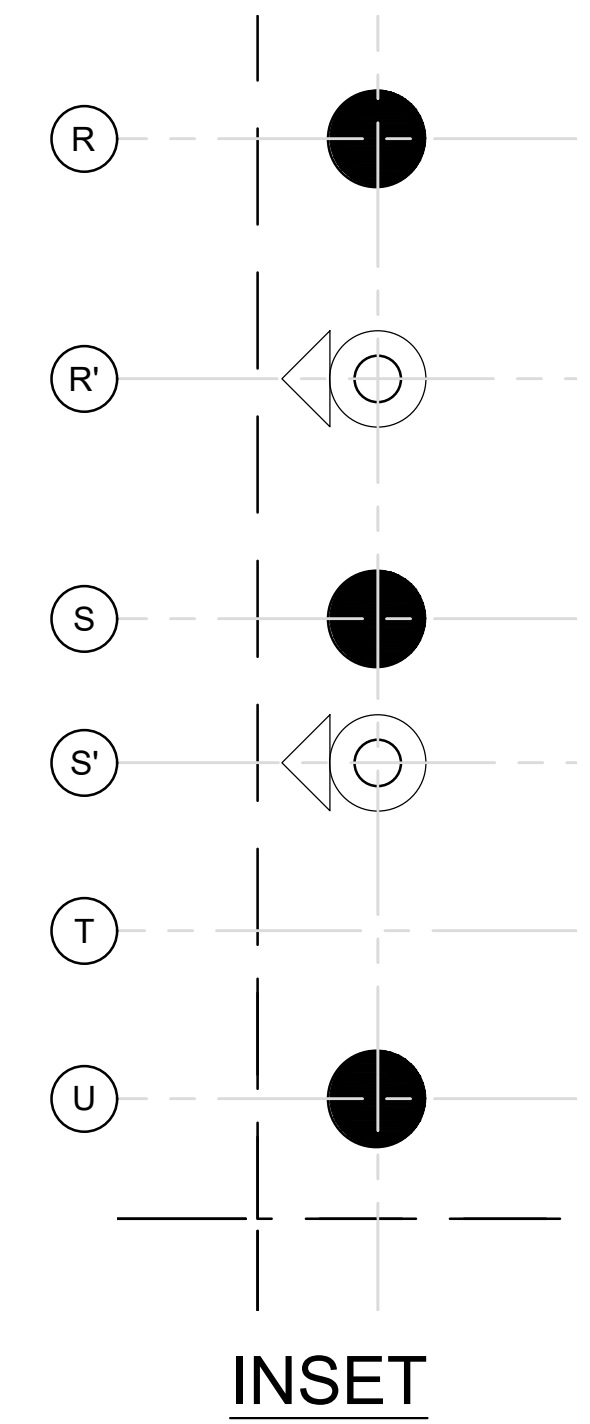
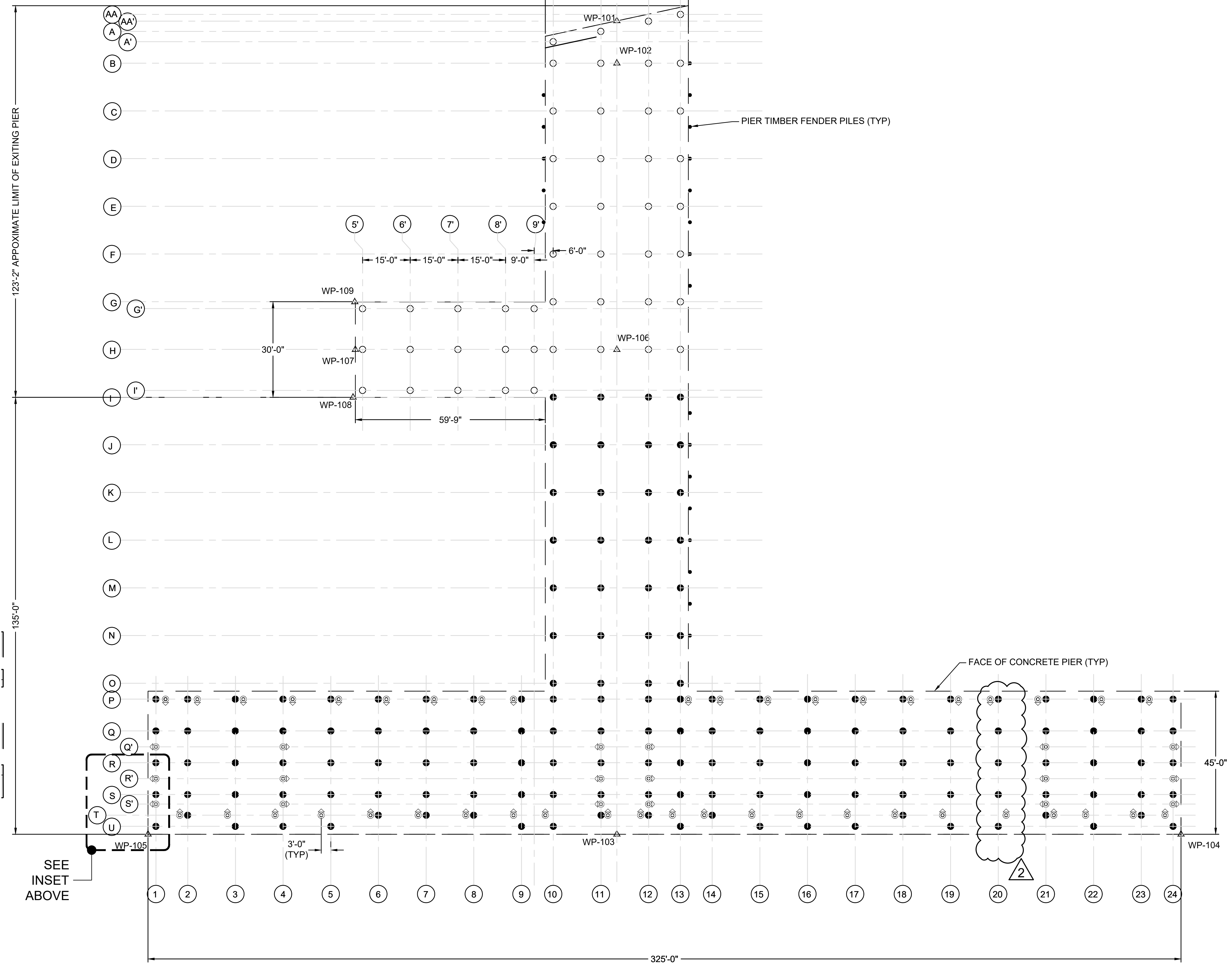
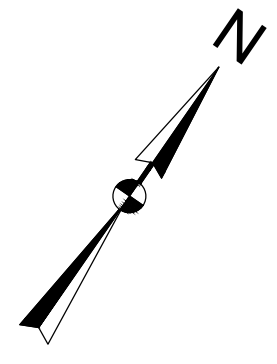
A SECTION - EAST BULKHEAD REPAIR
 SCALE: 1" = 2'

NOTES:
 1. DETAILS ON THIS SHEET ARE A COMPILATION OF AVAILABLE ARCHIVE INFORMATION. ACTUAL CONDITIONS MAY VARY. REFER TO REFERENCE DRAWINGS FOR ADDITIONAL DETAILS



I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REPRODUCED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
EAST BULKHEAD REPAIR SECTION BID ALTERNATE 3			
PREPARED BY:	GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	DRAWN BY: MEA	PROJECT NO. 35109.00	SCALE: AS NOTED
			REVISION NO.
			S-112
			SHEET NO. 41 OF 142



LEGEND

- ① PILE BENT NUMBER
- A PILE ROW DESIGNATION
- TIMBER FENDER PILE
- PIER SUPPORT PLUMB PILE WITH 0 FT ROCK ANCHOR, 0 FT ROCK SOCKET
- PIER SUPPORT PLUMB PILE WITH 5 FT ROCK SOCKET
- ⊙ PIER SUPPORT BATTER PILE WITH 20 FT ROCK ANCHOR, 5 FT ROCK SOCKET
- WP-101▲ WORKING/LAYOUT POINT (SEE DRAWING S-104)

PIER PLAN NOTES:

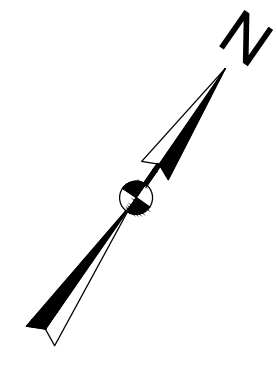
1. PIER SUPPORT PILES SHALL BE 24" DIA. x 0.625" THICK STEEL PIPE PILES. SEE PROJECT SPECIFICATIONS.
2. SEE SHEET S-133 FOR ROCK ANCHOR AND ROCK SOCKET INFORMATION.
3. SEE SHEET S-134, PIER PILE TABLE FOR ADDITIONAL INFORMATION.
4. SEE WATERFRONT STRUCTURES LAYOUT PLAN (S-104) FOR WORKING POINT (WP) COORDINATES.

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

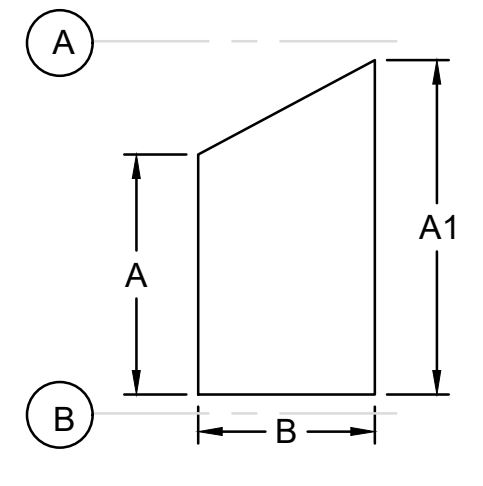
2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #3	DDF	3/1/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEDENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER PILE PLAN			
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC DESIGNED BY: MAR/AFS DATE: JANUARY 2024	REVIEWED BY: CWC DRAWN BY: BDW/MEA PROJECT NO. 03.0035109.00	CHECKED BY: DDF SCALE: REVISION NO.	DRAWING S-114 SHEET NO. 43 OF 142

PIER PILE PLAN
 1/16" = 1'-0"

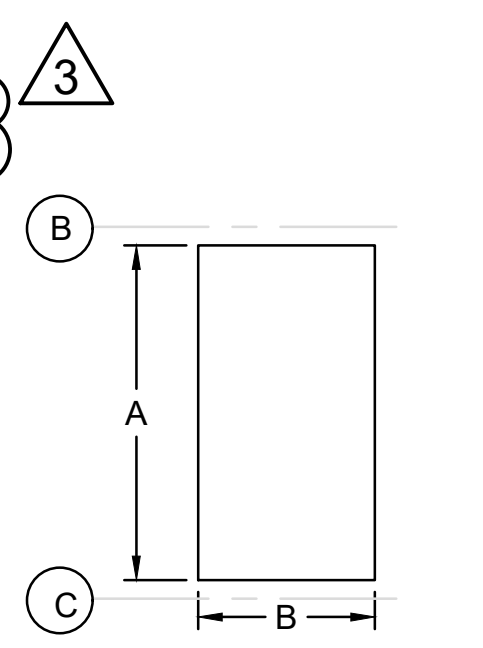
© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG S-114 PILE PLAN March 28, 2024 MICHAEL WERN



IRREGULAR 10" DECK PLANK SCHEDULE				
PLANK TYPE*	LENGTH 'A' (FT)	LENGTH 'A1' (FT)	WIDTH 'B' (FT)	QUANTITY
AA	3'-5"	5'-2"	8'-1 1/2"	1
AA'	5'-2"	6'-11"	8'-1 1/2"	1
GG	6'-11"	8'-2 1/2"	6'-0 1/4"	1
HH	9'-7 3/4"	11'-0 1/4"	6'-4 1/2"	1
II	12'-0"	11'-1"	5'-1 1/4"	1



10" DECK PLANK SCHEDULE			
PLANK TYPE*	LENGTH 'A' (FT)	WIDTH 'B' (FT)	QUANTITY
A	12'-2"	8'-1 1/2"	70
B	12'-2"	8'-11 3/4"	15
C	13'-7"	7'-6"	14
D	7'-2"	8'-1 1/2"	4
E	7'-2"	8'-11 3/4"	6
F	11'-1"	8'-1 1/2"	8
G	12'-2"	6'-0 1/4"	13
H	12'-2"	6'-4 1/2"	13
I	12'-2"	5'-1 1/4"	13
J	3'-4 1/4"	16'-3"	2
K	2'-4 1/4"	16'-3"	2
L	3'-8 1/4"	16'-3"	3
M	3'-8 1/4"	10'-8 1/4"	1
N	13'-7"	7'-6"	2



NOTE:
SEE DRAWING S-153 FOR PLANK DETAILS.

LEGEND

- PRE-CAST CONCRETE
- ELECTRICAL TRENCH
- MECHANICAL TRENCH

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

3	ADDENDUM #7	DDF	3/29/2024
2	ADDENDUM #5	DDF	3/15/2024
1	ADDENDUM #4	DDF	3/8/2024
NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE

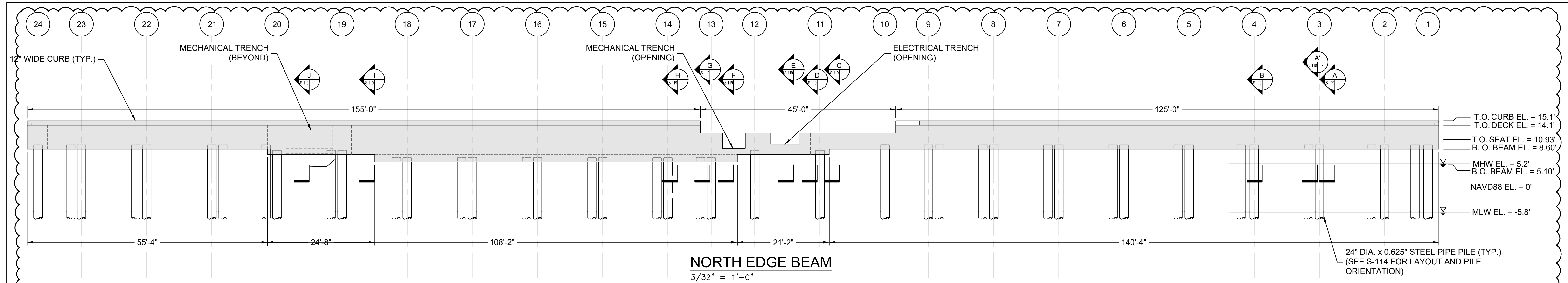
PIER DECK PLANK PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com
PREPARED FOR: MAINE MARITIME ACADEMY
CASTINE, ME

PROJ MGR: RKC	DESIGNED BY: MAR	REVIEWED BY: CWC	CHECKED BY: DDF	S-116 DRAWING SCALE: AS NOTED REVISION NO.
DATE: JANUARY 2024	DRAWN BY: BDW	PROJECT NO. 03.0035109.00	REVISION NO.	

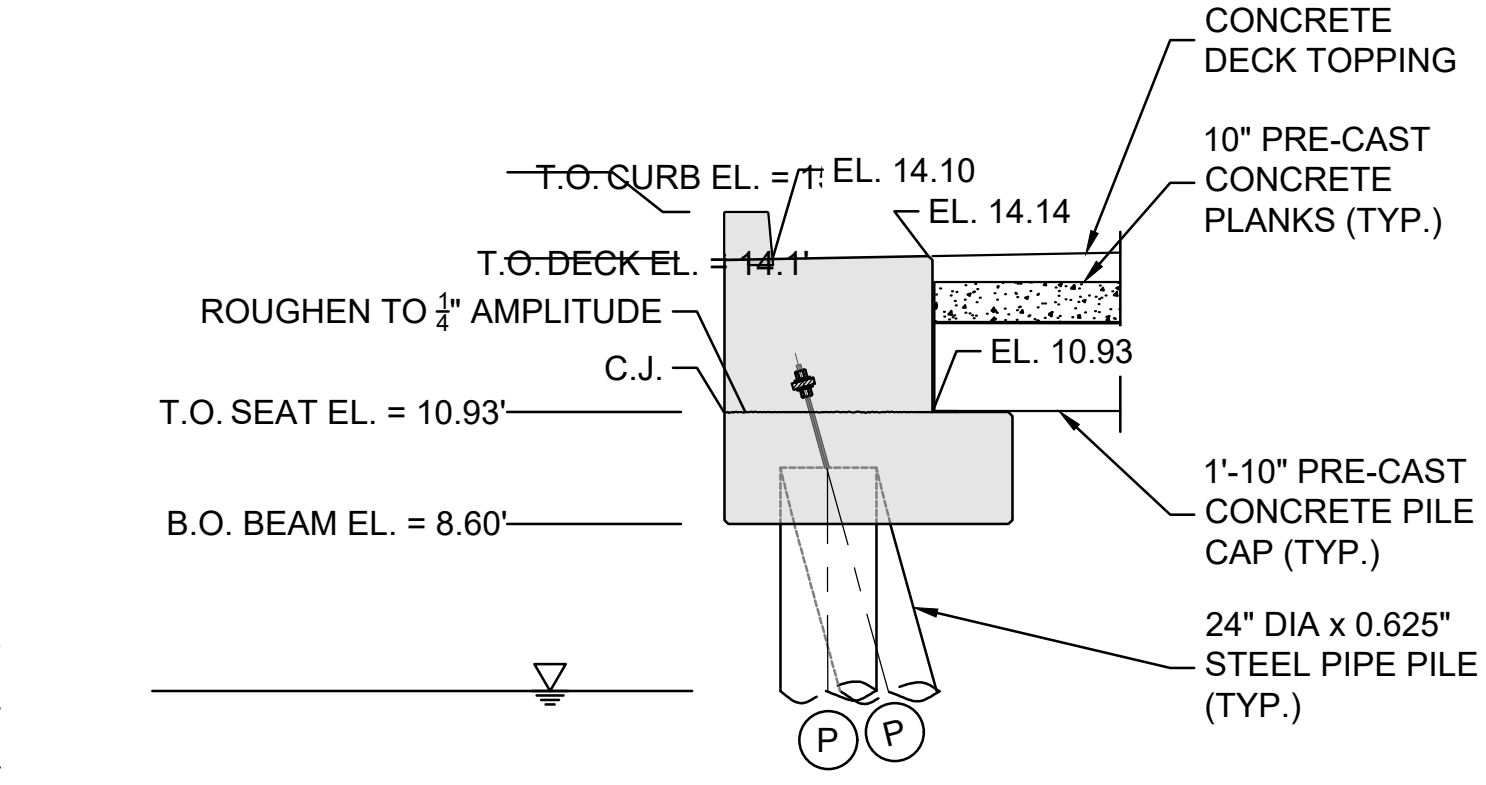
© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG 5-116 PLANK PLAN Macro 28, 2024 MICHAEL ASBEN
 GZA is a U.S. GEOLOGICAL SURVEY CONTRACTOR

PIER DECK PLANK PLAN
1/16" = 1'-0"

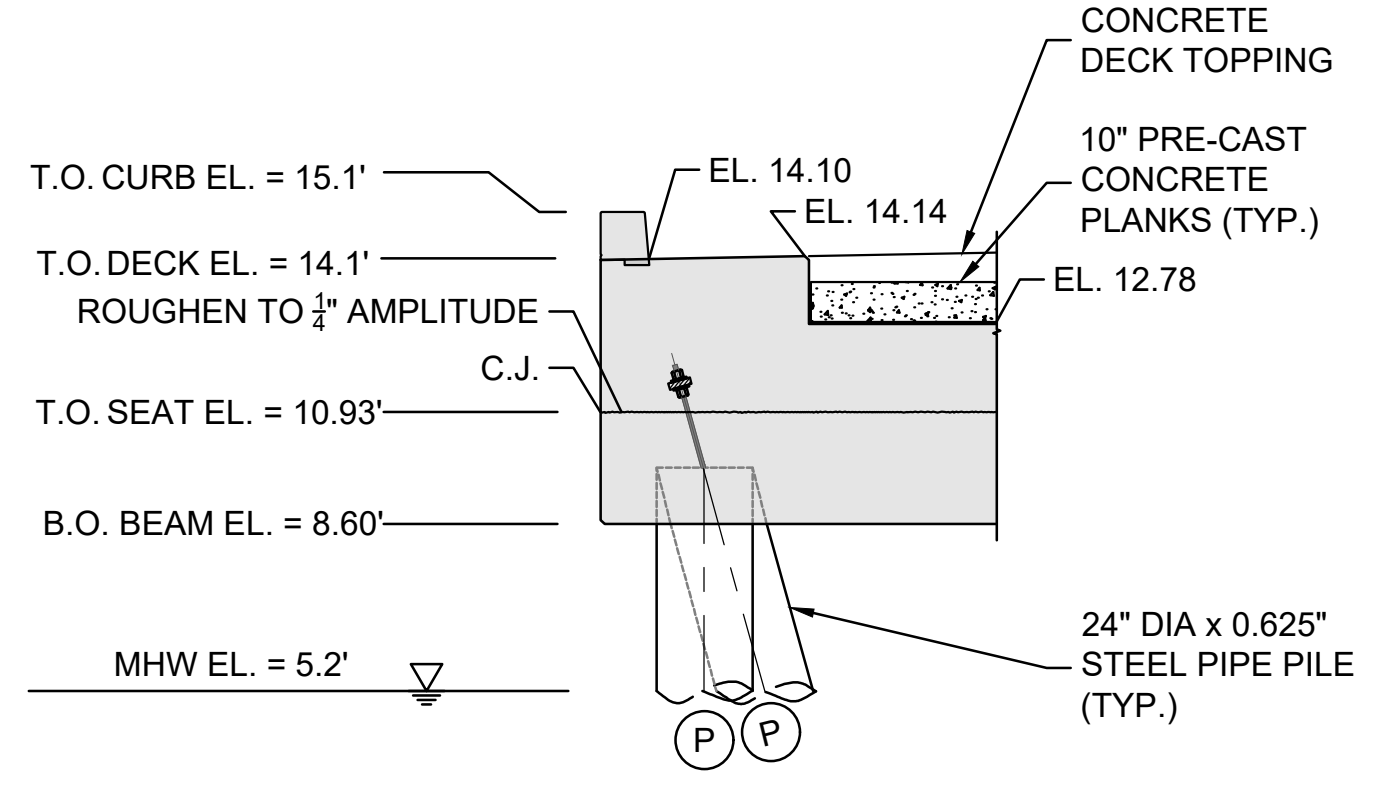


NORTH EDGE BEAM
3/32" = 1'-0"

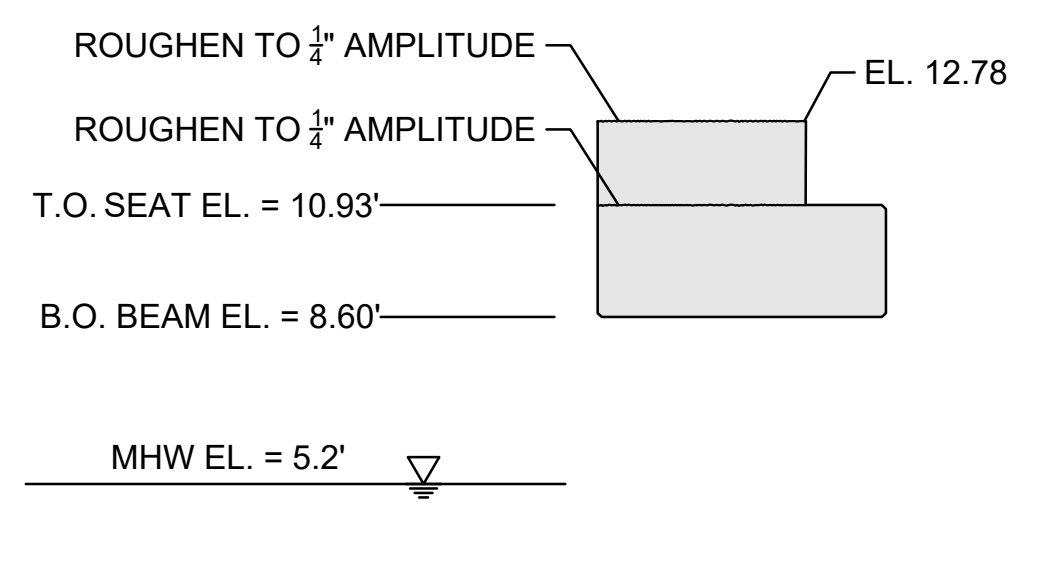
24" DIA. x 0.625" STEEL PIPE PILE (TYP.)
(SEE S-114 FOR LAYOUT AND PILE ORIENTATION)



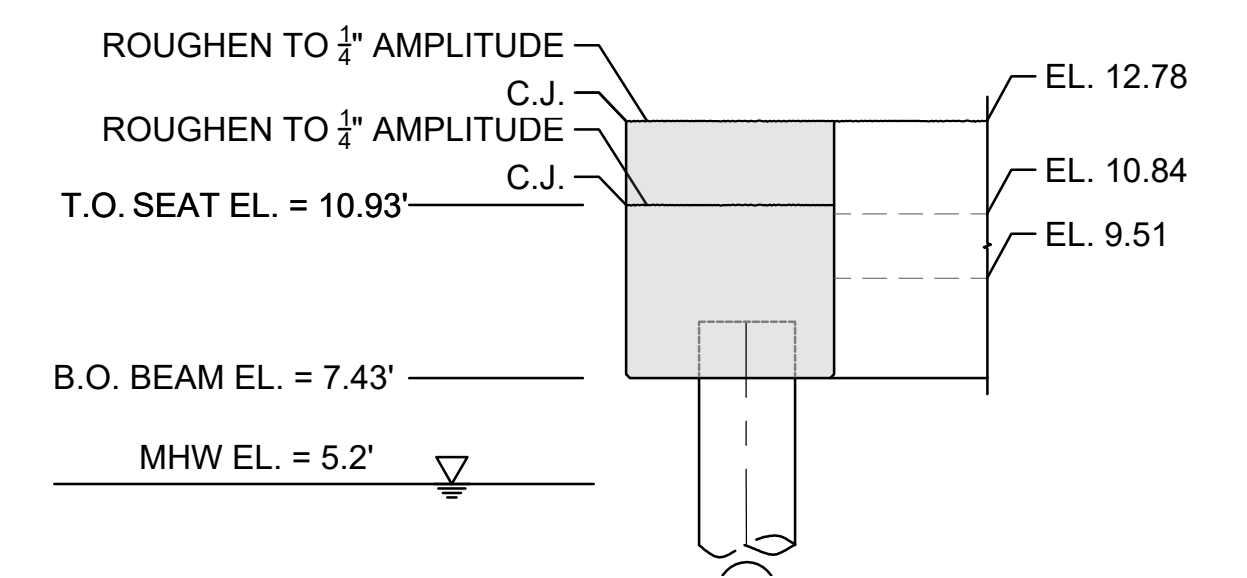
A SECTION - NORTH EDGE BEAM @ BENT 3
S-119 1/4" = 1'-0"



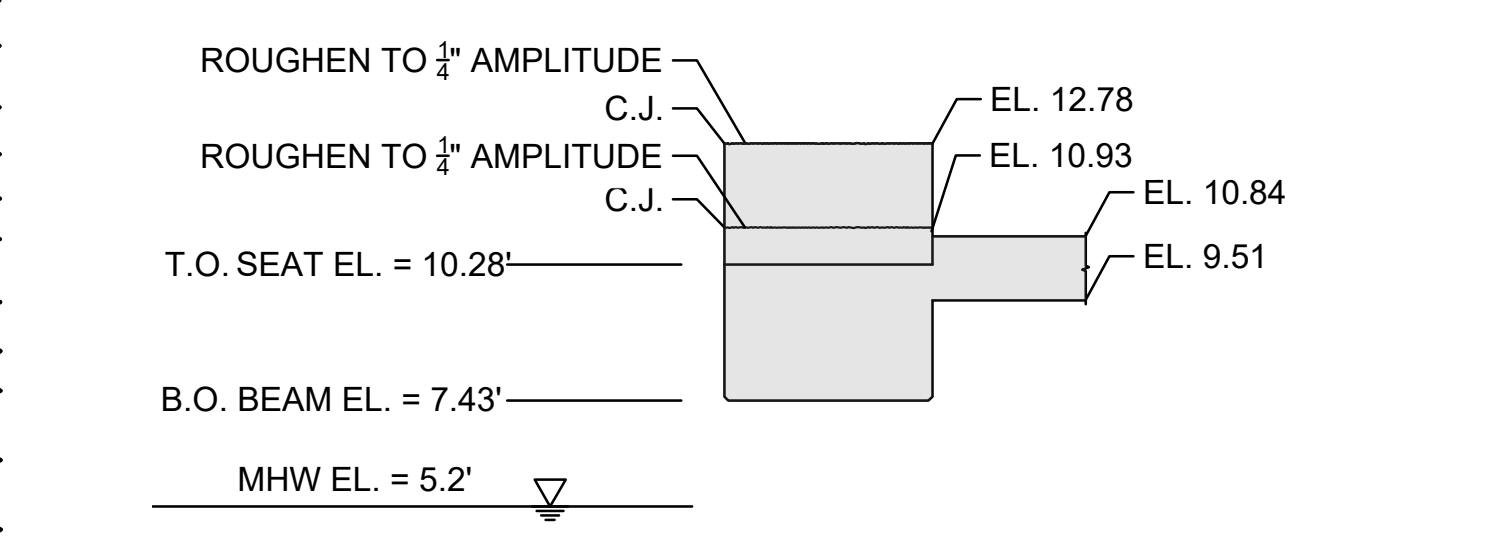
B SECTION - NORTH EDGE BEAM @ BENT 4
S-119 1/4" = 1'-0"



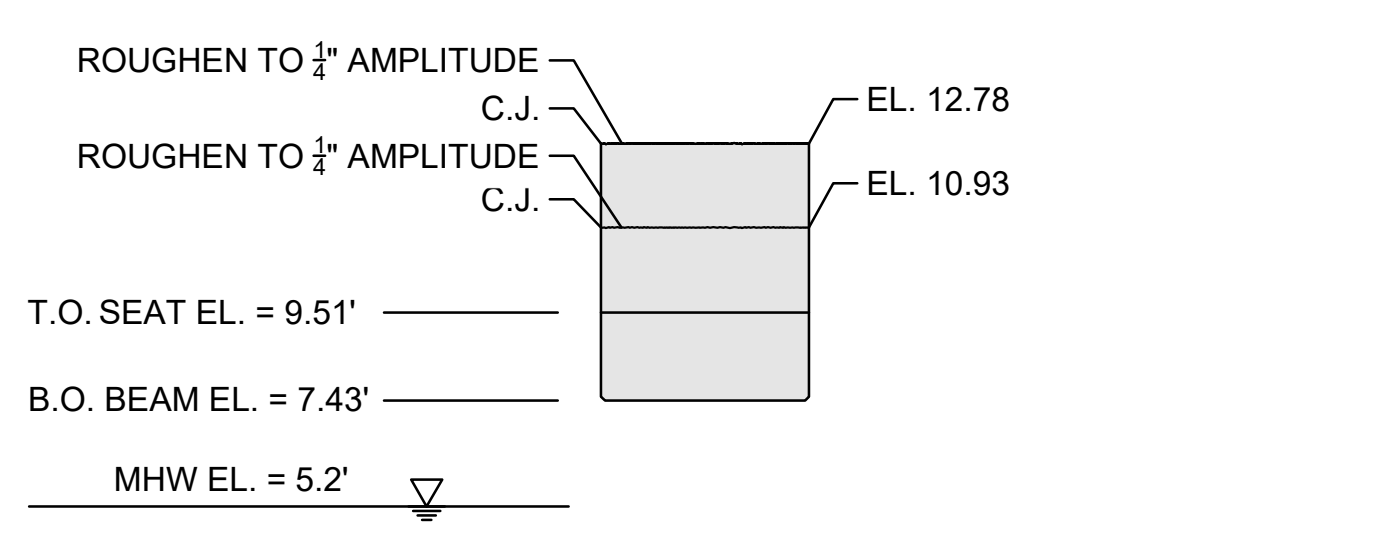
C SECTION - NORTH EDGE BEAM @ BENT 10 - 11
S-119 1/4" = 1'-0"



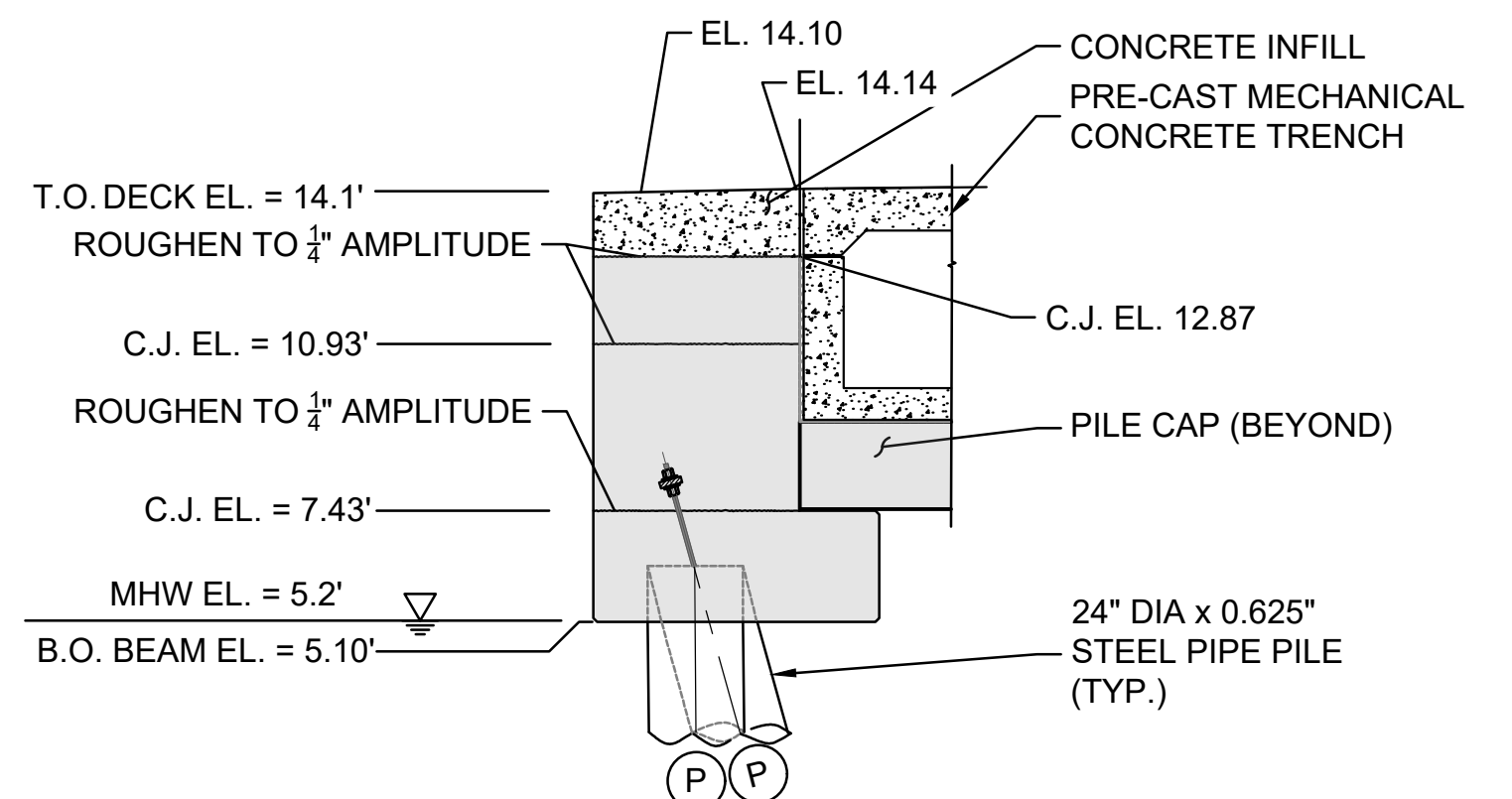
D SECTION - NORTH EDGE BEAM @ BENT 11
S-119 1/4" = 1'-0"



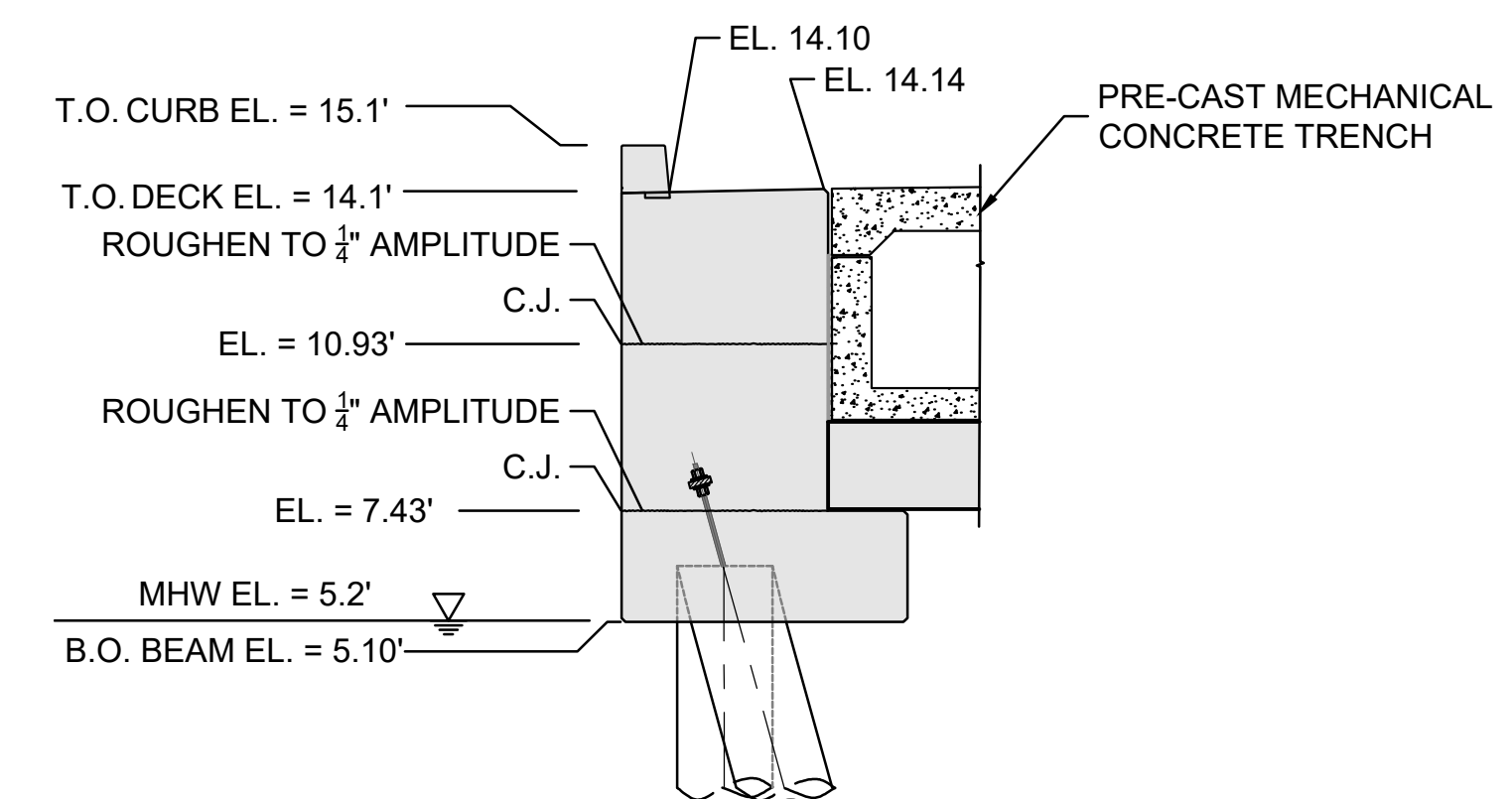
E SECTION - NORTH EDGE BEAM @ M. TRENCH
S-119 1/4" = 1'-0"



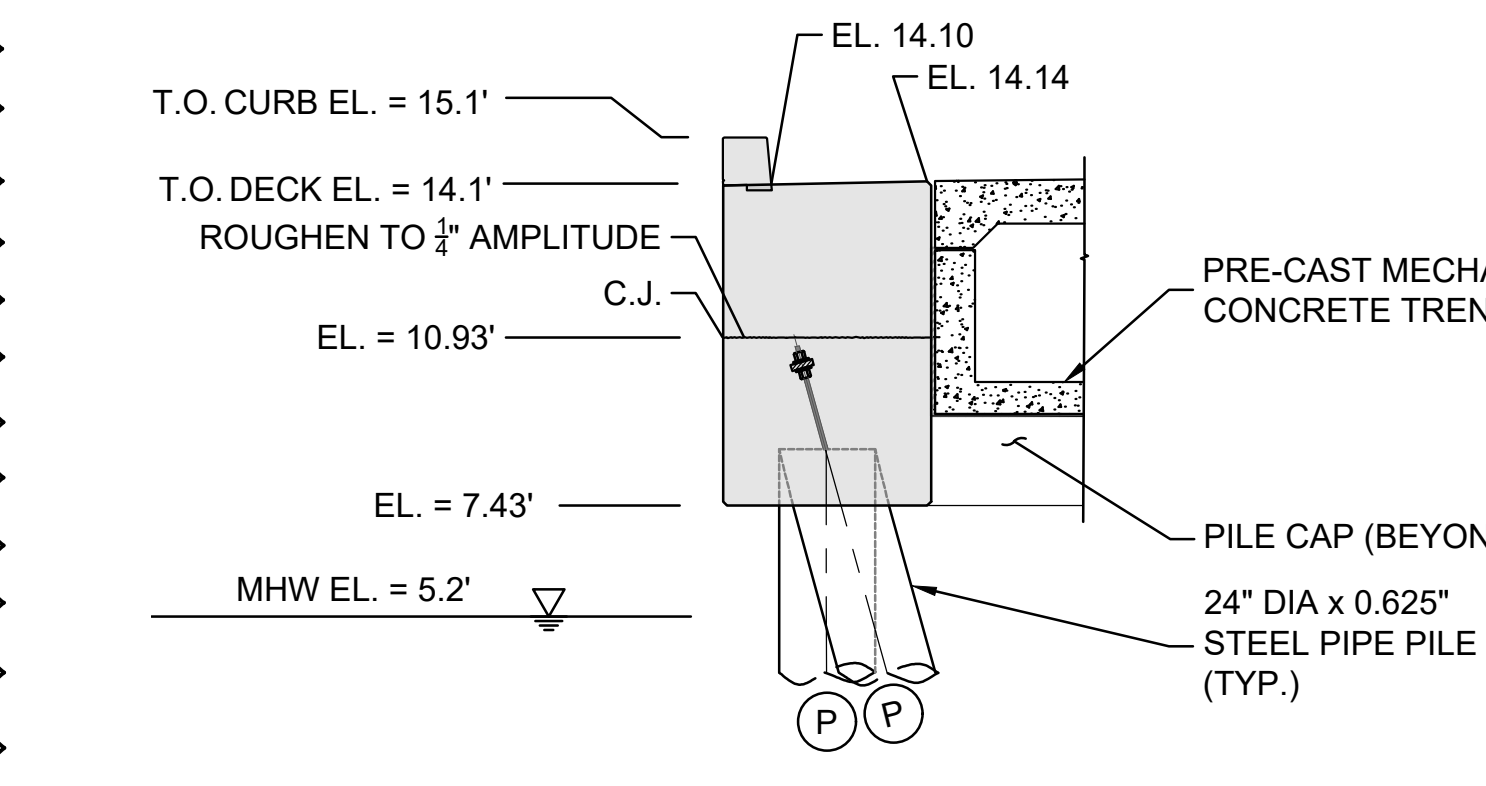
F SECTION - NORTH EDGE BEAM @ E. TRENCH
S-119 1/4" = 1'-0"



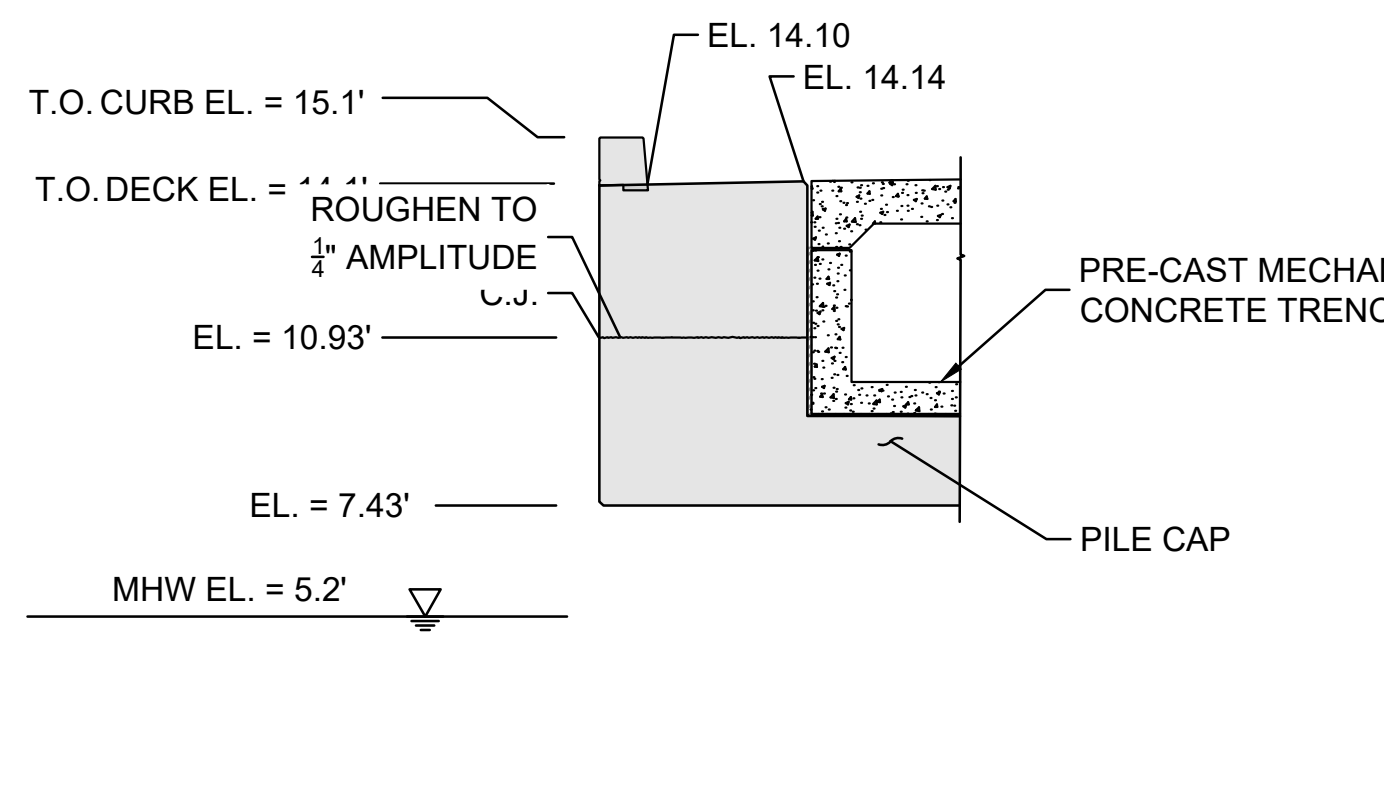
G SECTION - NORTH EDGE BEAM @ BENT 13
S-119 1/4" = 1'-0"



H SECTION - NORTH EDGE BEAM @ BENT 14
S-119 1/4" = 1'-0"



I SECTION - NORTH EDGE BEAM @ BENT 18 - 19
S-119 1/4" = 1'-0"



J SECTION - NORTH EDGE BEAM @ BENT 19 - 20 (CAPS 5A/5B)
S-119 1/4" = 1'-0"

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

ADDENDUM #7		DOF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
1			

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

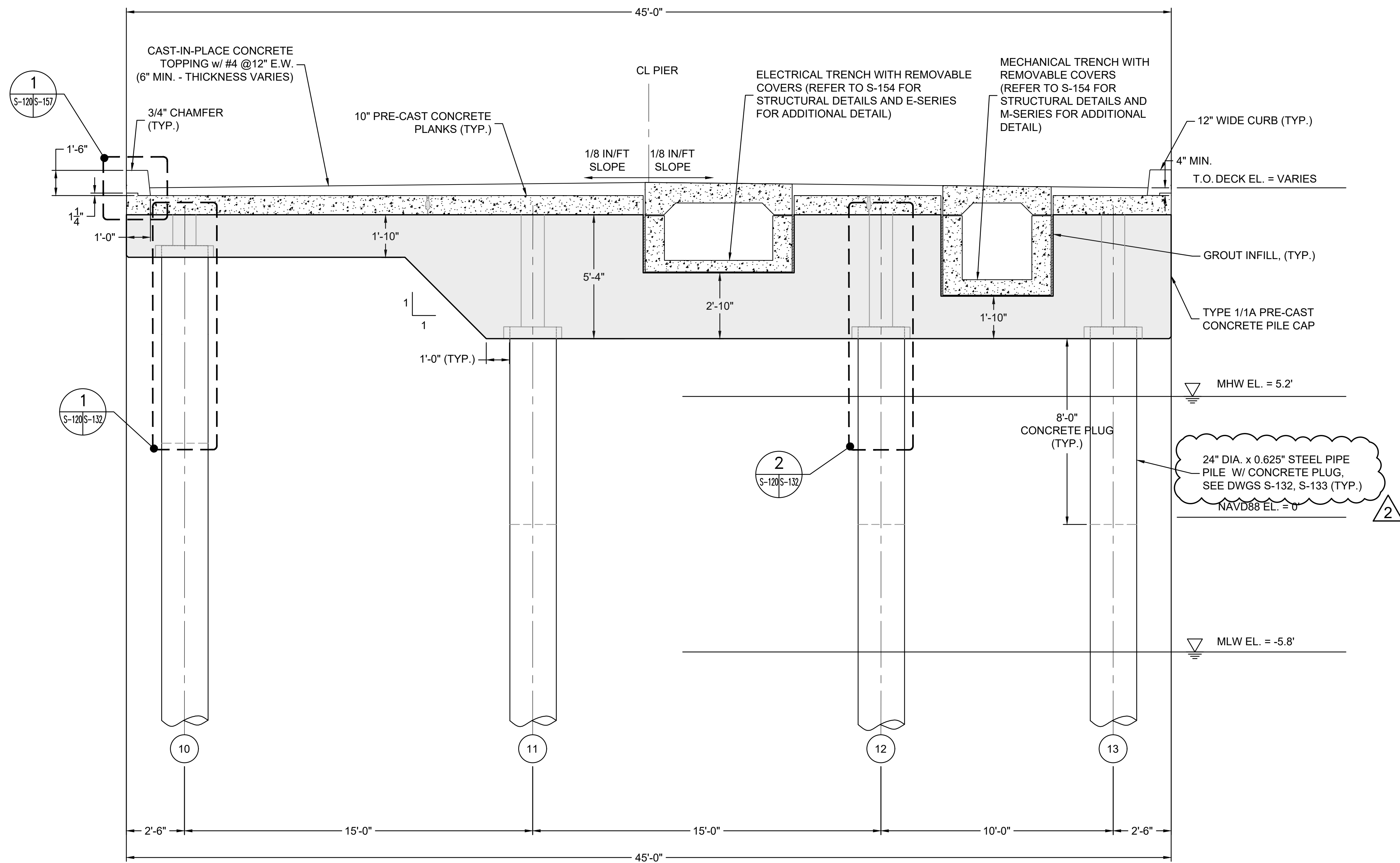
**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE**

**NORTH EDGE BEAM
ELEVATION AND SECTIONS**

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: DRAWN BY: BDW PROJECT NO.: 03.0035109.00
CHECKED BY:	SCALE: REVISION NO.

DRAWING
S-119
SHEET NO. 48 OF 142

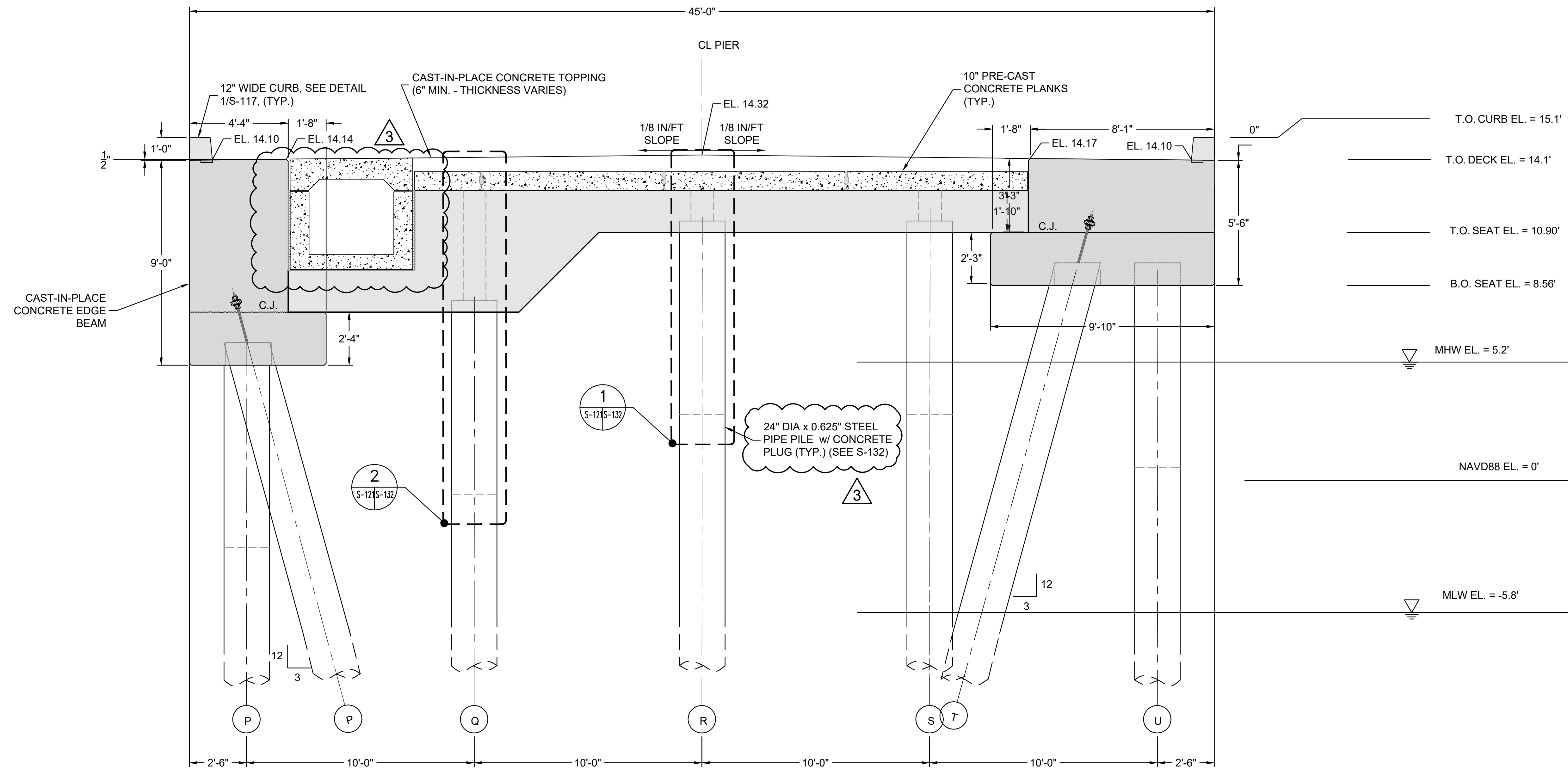
© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS ADD-2024-02-29.DWG S-119 NORTH EDGE BEAM March 27, 2024 MICHAEL AUBIN



A SECTION: TYPE 1 PILE CAP (PRE-CAST)
 S-1135-120 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

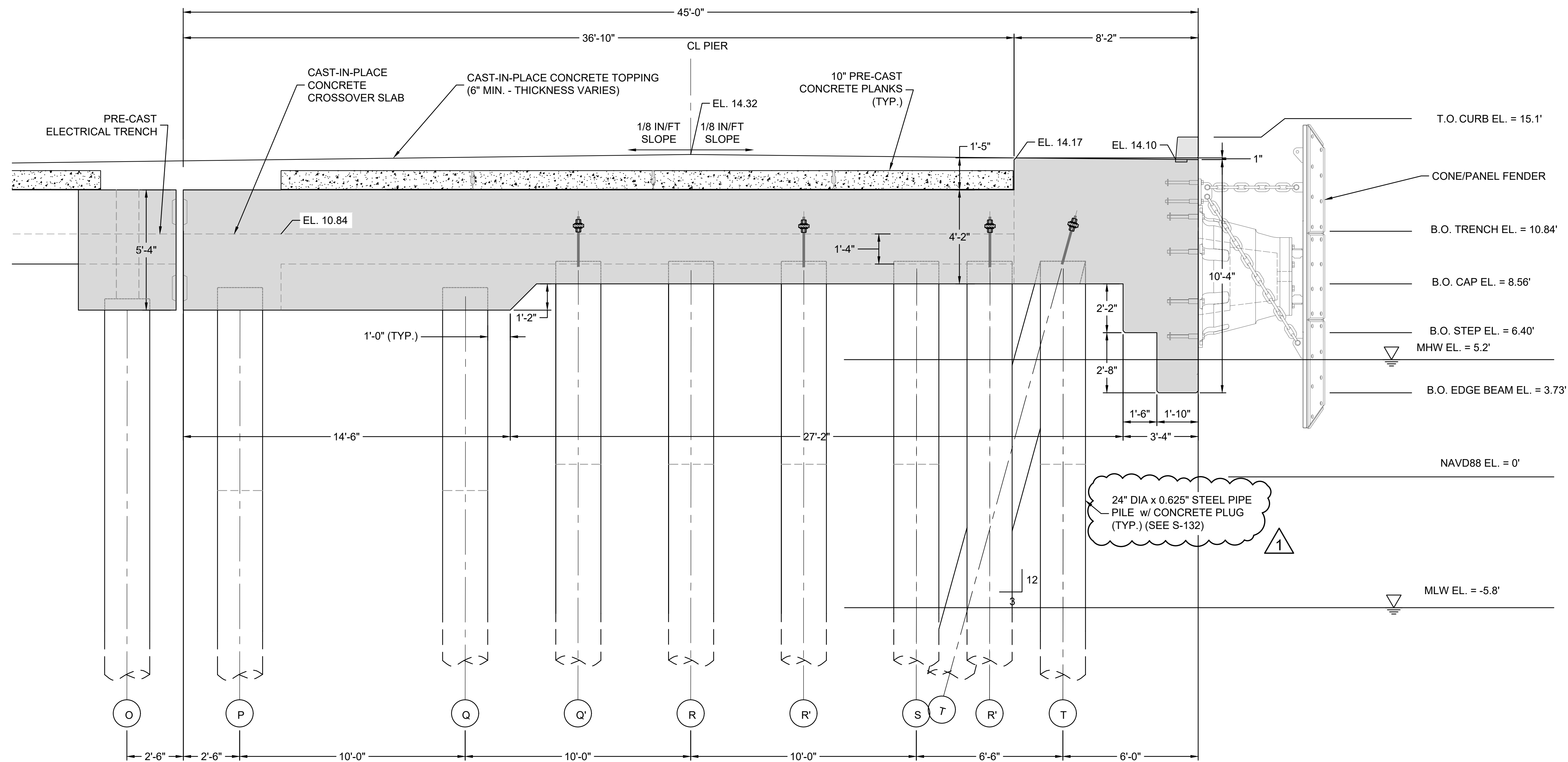
2	ADDENDUM #7	DDF	3/29/2024	
1	ADDENDUM #4	DDF	3/8/2024	
NO.	ISSUE/DESCRIPTION	BY	DATE	
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.				
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE				
PIER SECTIONS - 1 SECTION A - TYPE 1 CAP				
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME		
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: DRAWN BY: BDW PROJECT NO. 03.0035109.00	CHECKED BY: SCALE: REVISION NO.	DRAWING S-120 SHEET NO. 49 OF 142	



C SECTION: PILE CAP TYPE 5 (PRE-CAST)
 S-113/S-122 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

3	ADDENDUM #7	DDF	3/29/2024
2	ADDENDUM #4	DDF	3/8/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER SECTIONS - 3 SECTION C - TYPE 5 CAP			
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: DRAWN BY: BDW PROJECT NO.: 03.0035109.00	CHECKED BY: SCALE: REVISION NO.:	DRAWING S-122 SHEET NO. 51 OF 142

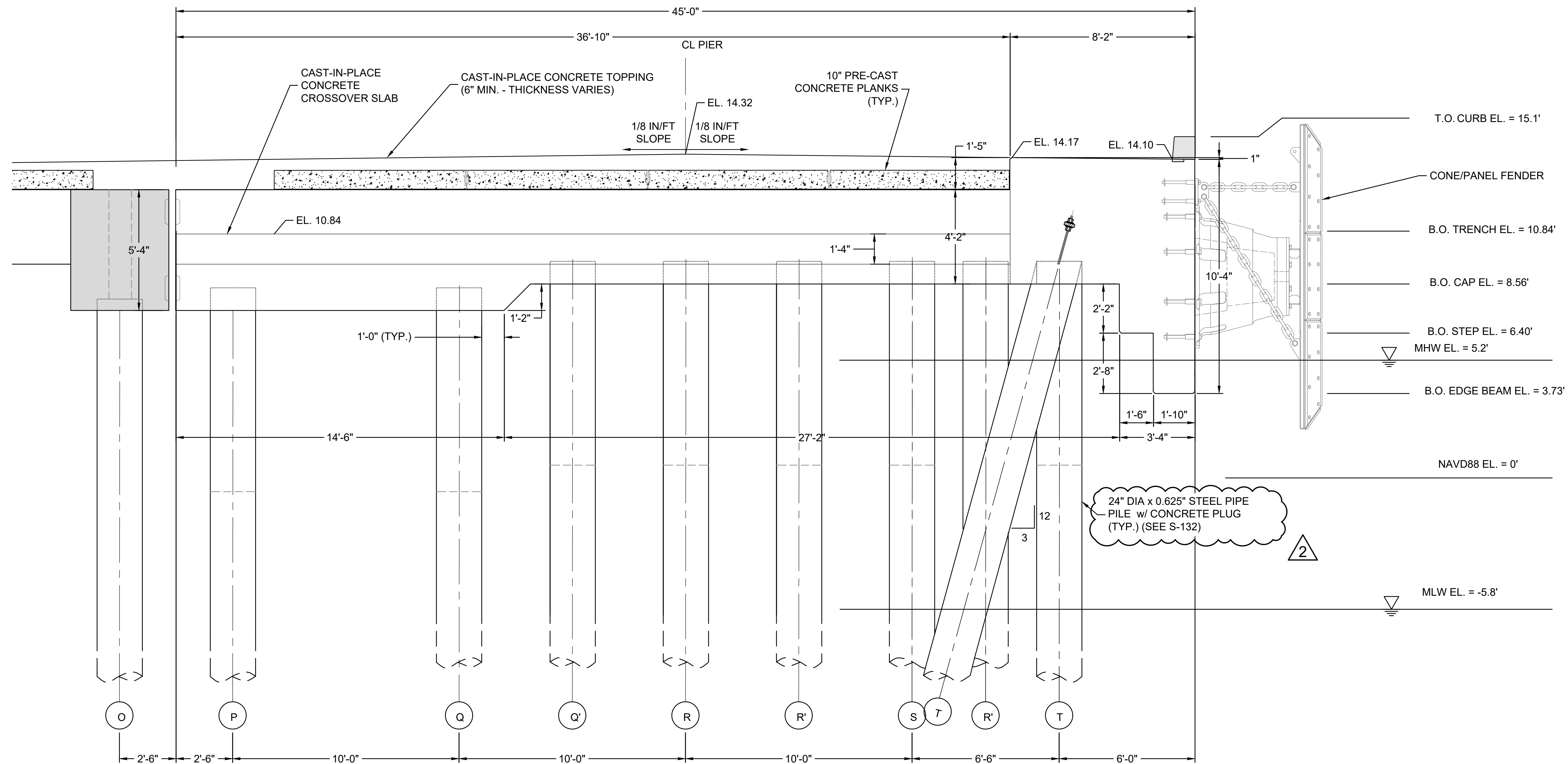


D SECTION: TYPE 4A PILE CAP (C.I.P.)
 S-113 S-123 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #5	DDF	3/15/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER SECTIONS - 3 SECTION D - TYPE 4A CAP			
PREPARED BY:	GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR:	MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR:	RKC	REVIEWED BY:	CHECKED BY:
DESIGNED BY:	MAR	DRAWN BY:	BDW
DATE:	JANUARY 2024	PROJECT NO.:	03.0035109.00
			DRAWING SCALE: S-123 REVISION NO.
			SHEET NO. 52 OF 142

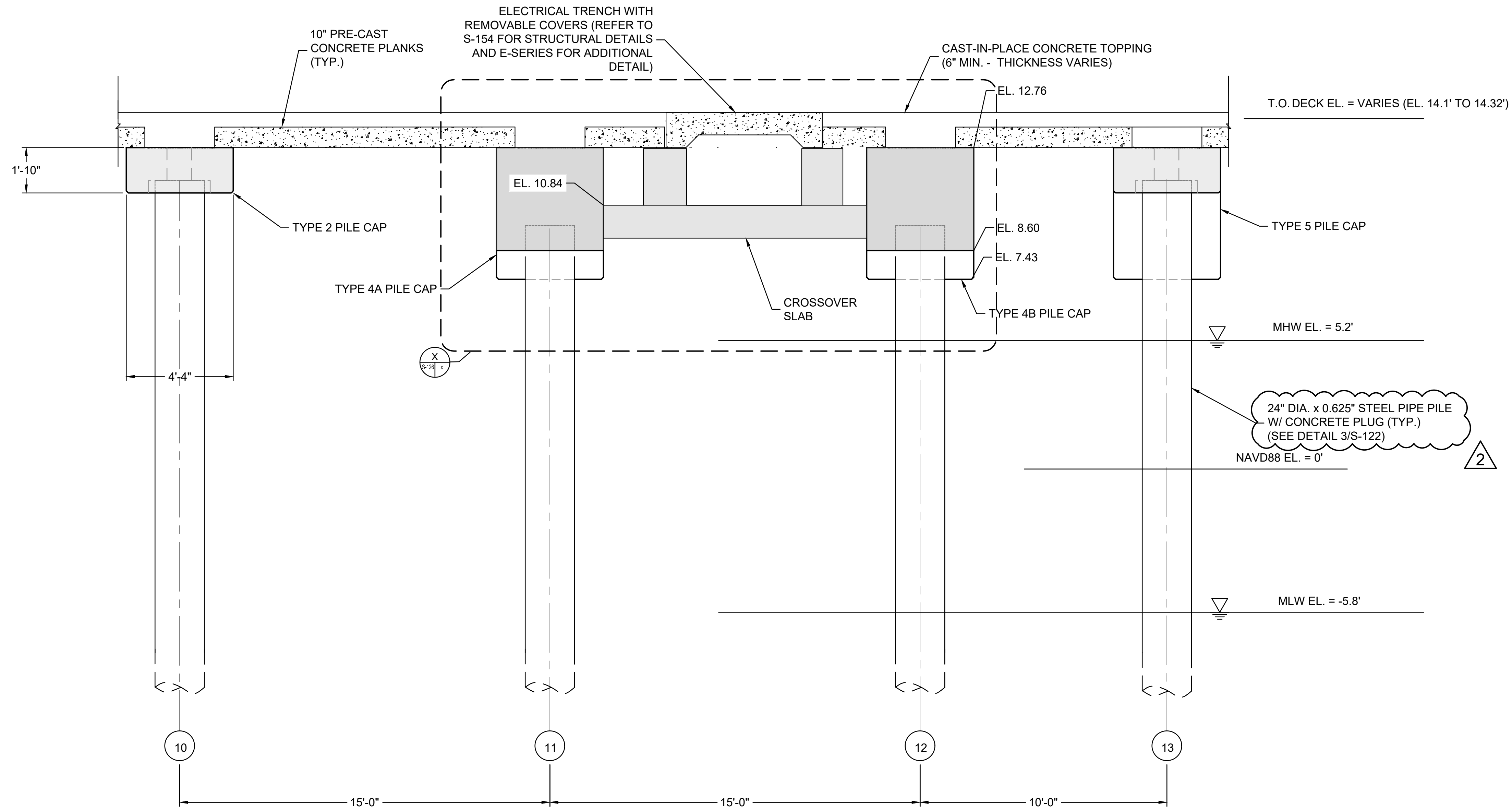
© 2024 - GZA GeoEnvironmental, Inc.
 GZA is a U.S. GEOLOGICAL SURVEY (USGS) VENDOR. THIS DRAWING IS THE SOLE PROPERTY OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.
 WATERFRONT IMPROVEMENTS_ADD_2024-02-28.DWG S-123 SECT. D (TYPE 4A) March 28, 2024 MICHAEL AUBIN



E SECTION: TYPE 4B PILE CAP (C.I.P.)
 S-113S-124 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #5	DDF	3/15/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER SECTIONS - 3 SECTION E - TYPE 4B CAP			
PREPARED BY:	GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR:	MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR:	RKC	REVIEWED BY:	CHECKED BY:
DESIGNED BY:	MAR	DRAWN BY:	BDW
DATE:	JANUARY 2024	PROJECT NO.:	03.0035109.00
			DRAWING SCALE: REVISION NO.
			S-124 SHEET NO. 53 OF 142



I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

G SECTION: PILE CAP 4A & 4B @ TRENCH (C.I.P.)
 S-113S-126 3/8" = 1'-0"

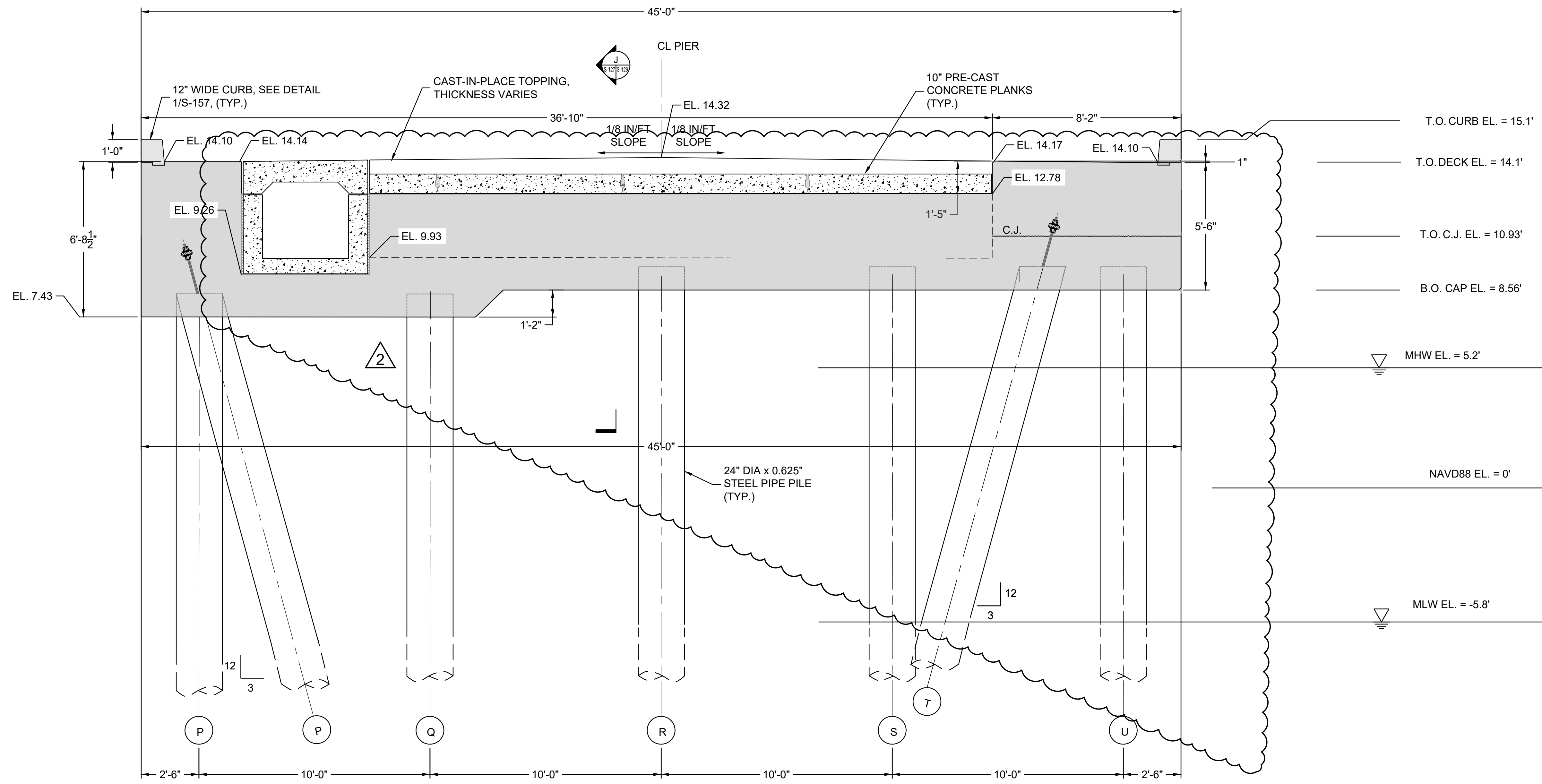
NO.	ADDENDUM #4 ISSUE/DESCRIPTION	DDF	BY	DATE
1				3/8/2024

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEDENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
 PIER UPGRADES AND WATERFRONT IMPROVEMENTS
 CASTINE, MAINE**

**PIER SECTIONS - 7
 SECTION G - PILE CAPS 4A/4B @ TRENCH**

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: BDW DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY: SCALE: REVISION NO.	DRAWING S-126 SHEET NO. 55 OF 142

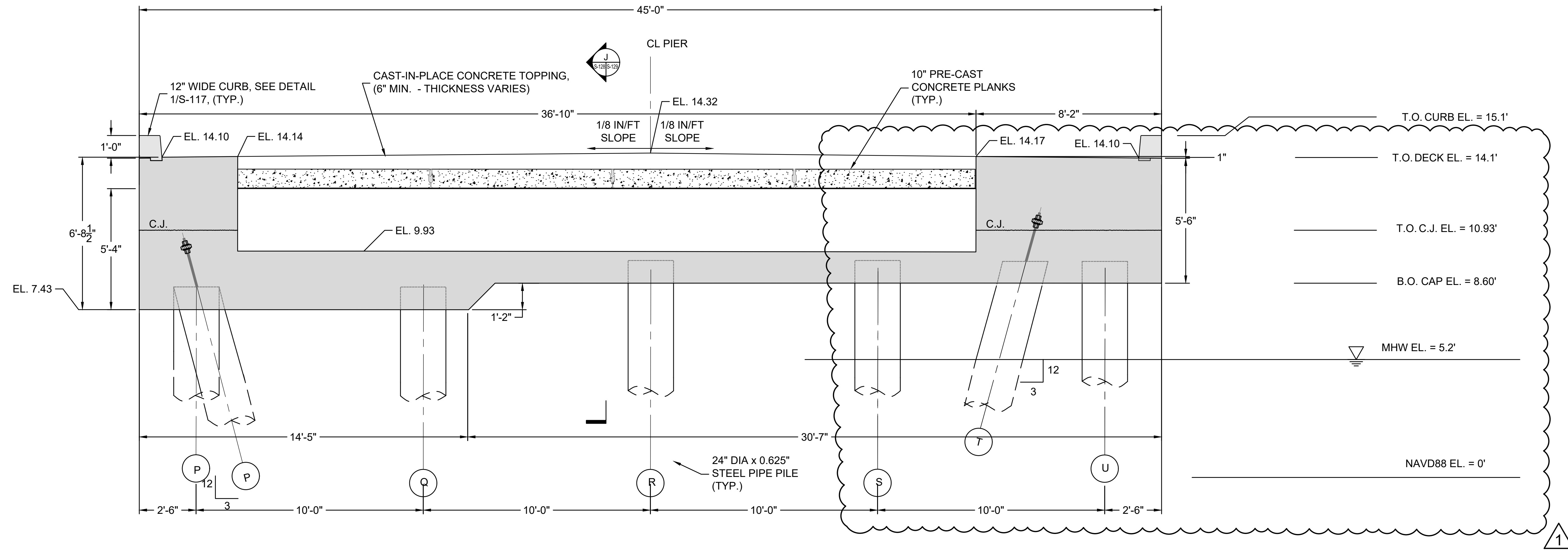


H SECTION: PILE CAP TYPE 5A (C.I.P.)
 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #4	DDF	3/8/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER SECTIONS - 8 SECTION H - PILE CAP TYPE 5A			
PREPARED BY:	GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR:	MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR:	RKC	REVIEWED BY:	CHECKED BY:
DESIGNED BY:	MAR	DRAWN BY:	BDW
DATE:	JANUARY 2024	PROJECT NO.:	03.0035109.00
		REVISION NO.:	
			S-127 SHEET NO. 56 OF 142

© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG 5-127 SECT. H (TYPE 5A) March 27, 2024 MICHAEL AUBIN

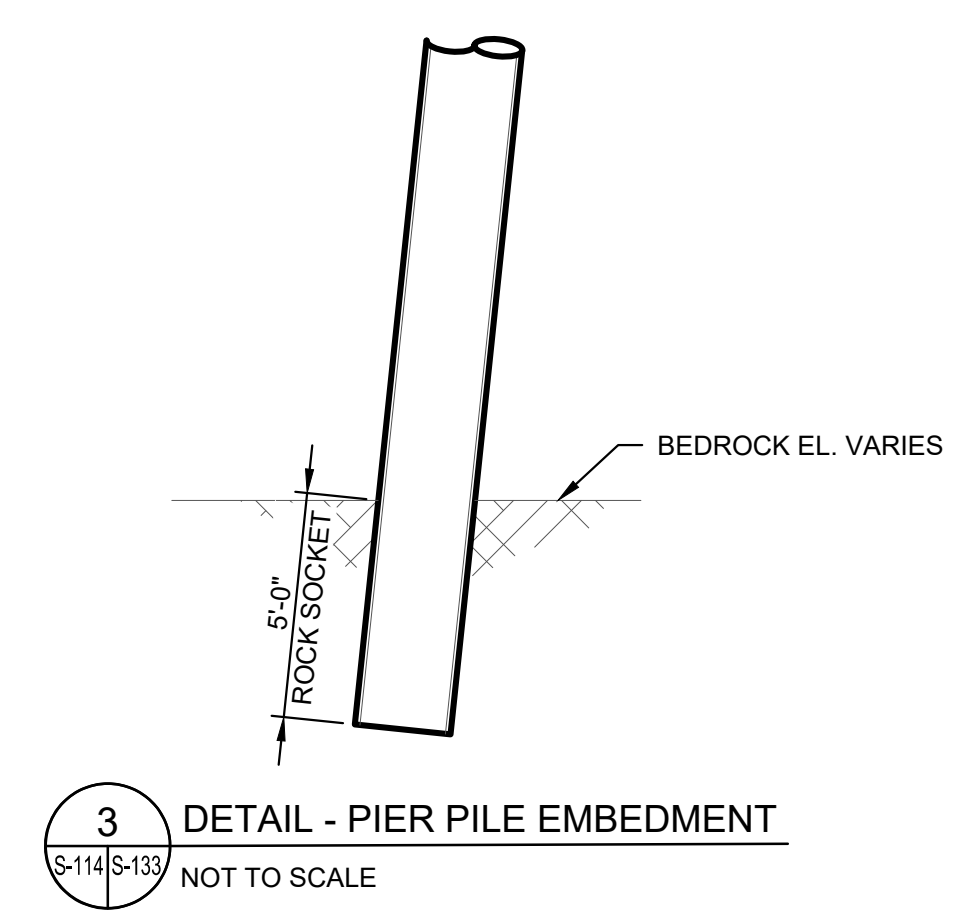
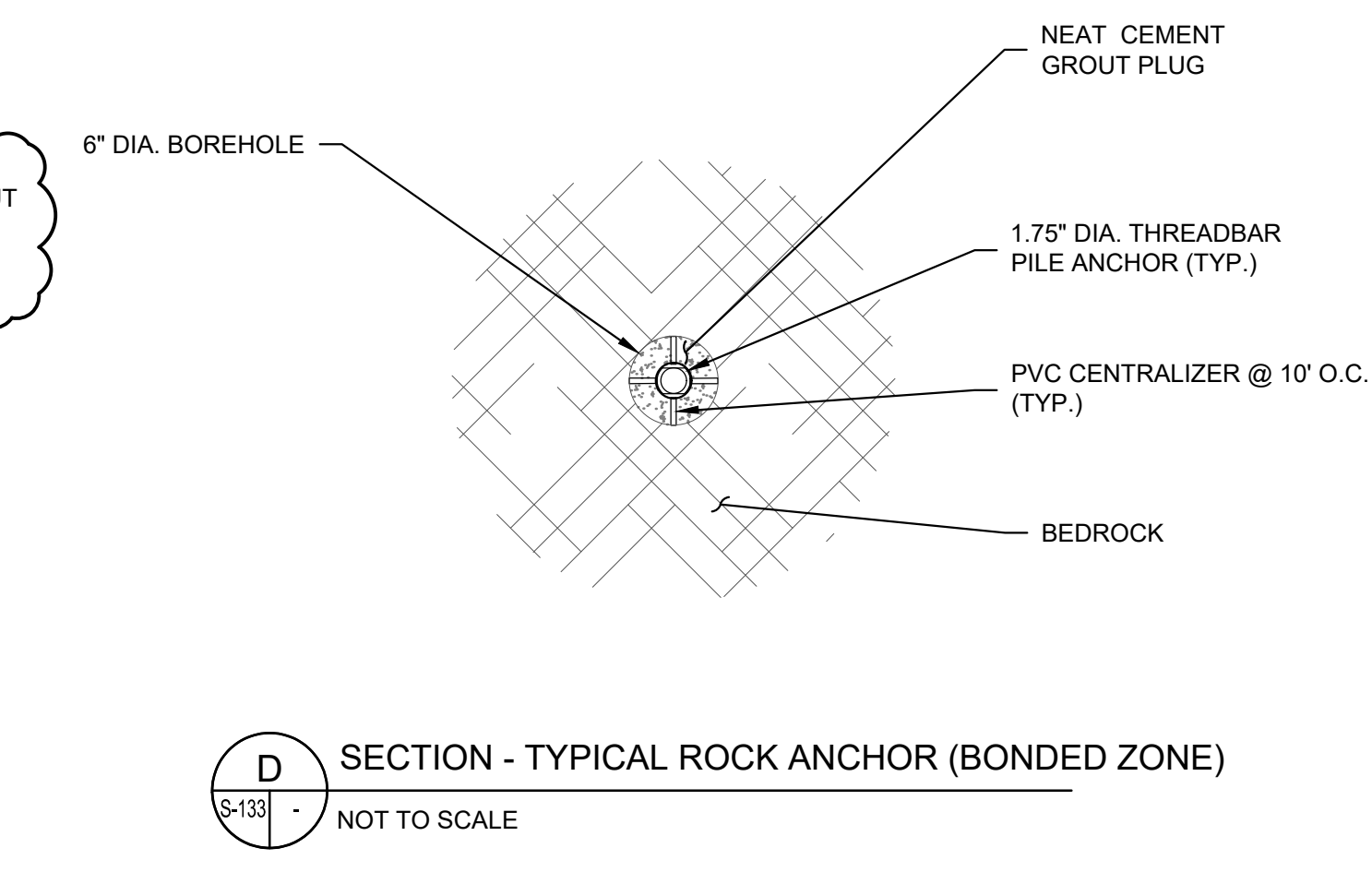
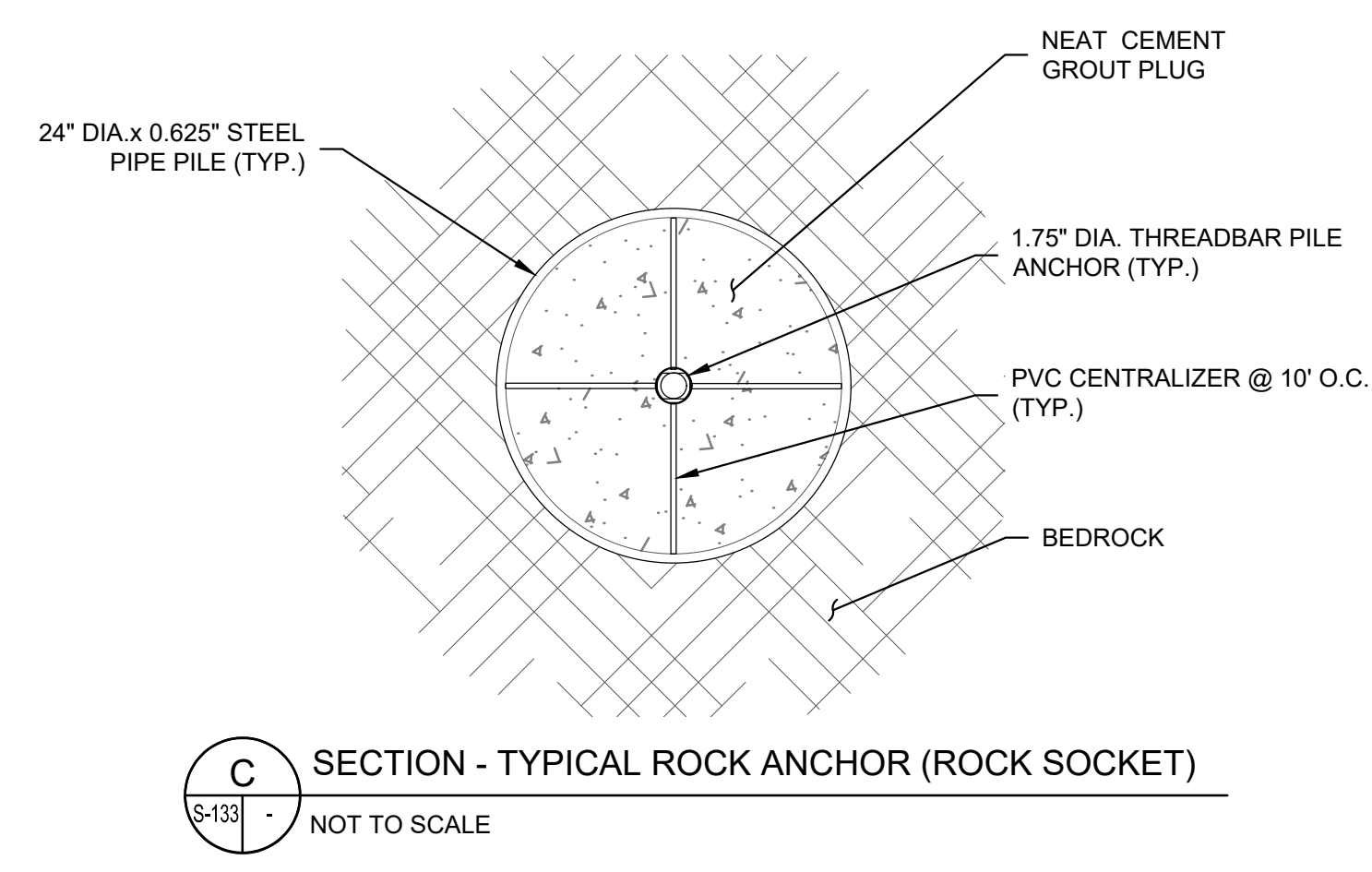
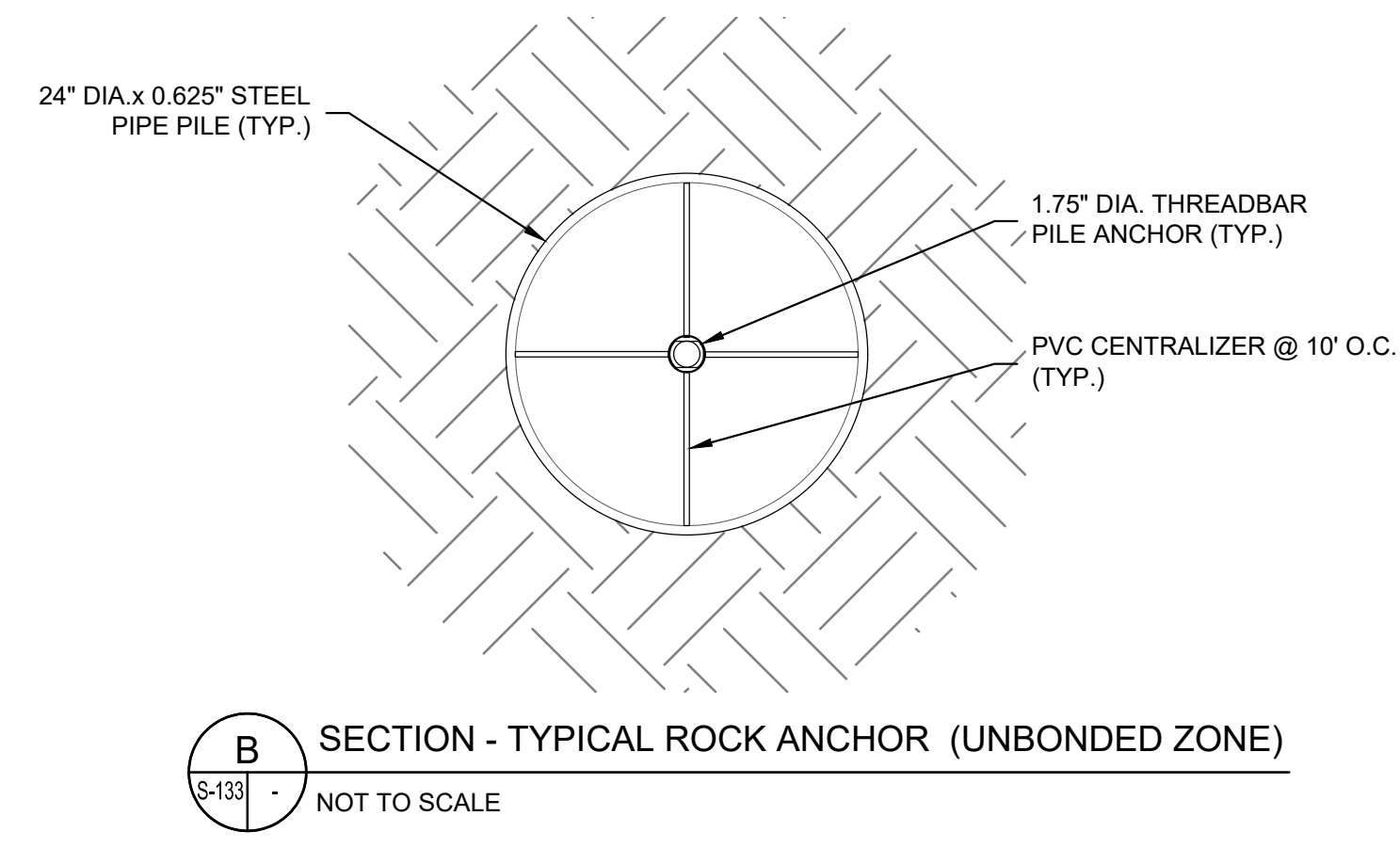
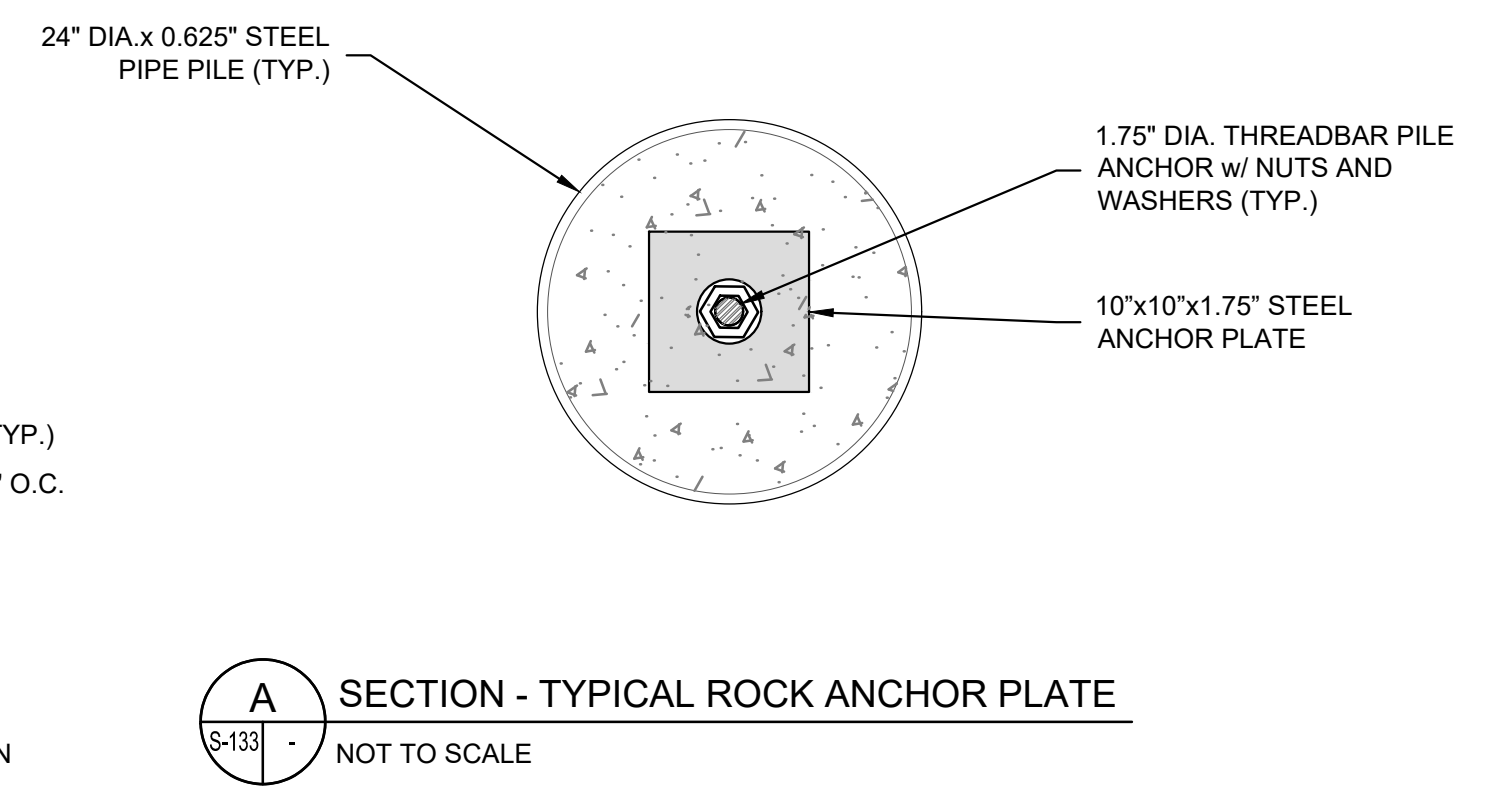
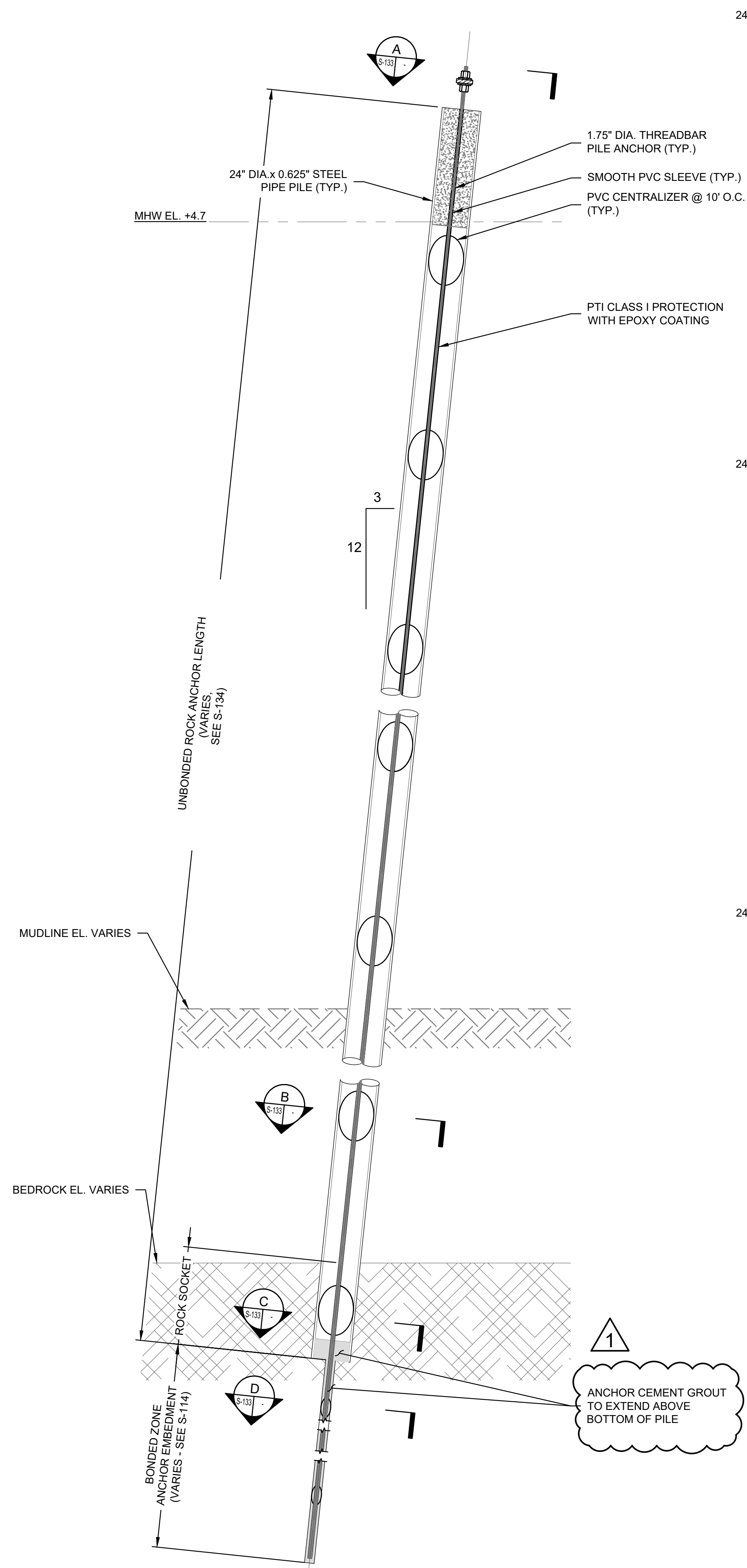


I SECTION: PILE CAP TYPE 5B (C.I.P)
 5-1135-128 3/8" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

2	ADDENDUM #7	DDF	3/29/2024	
1	ADDENDUM #4	DDF	3/8/2024	
NO.	ISSUE/DESCRIPTION	BY	DATE	
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.				
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE				
PIER SECTIONS - 8 SECTION H - PILE CAP TYPE 5B				
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME		
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: DRAWN BY: BDW PROJECT NO. 03.0035109.00	CHECKED BY: SCALE: REVISION NO.	DRAWING S-128 SHEET NO. 57 OF 142	

© 2024 GZA GeoEnvironmental, Inc. GZA is a U.S. and U.K. registered company. U.S. REG. NO. 02-29-DWG S-114 PER ROCK ANCHOR (P19) February 5, 2024, WISCONSIA, MALDEN



1 DETAIL - TYPICAL ROCK ANCHOR
NOT TO SCALE

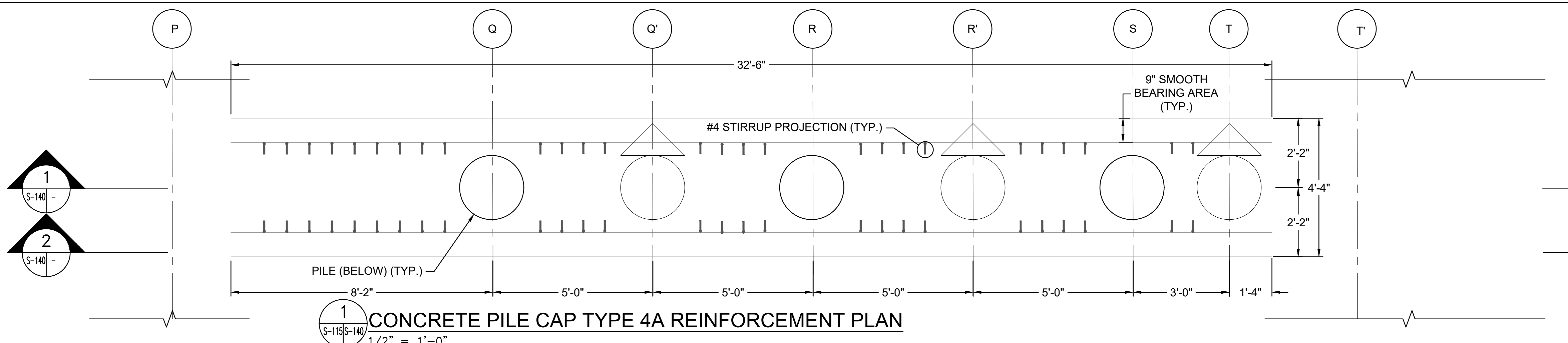
I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
PIER PILE AND ROCK ANCHOR DETAILS			
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	DRAWN BY: MEA	SCALE: AS NOTED	REVISION NO.
	PROJECT NO. 35109.00		
			S-133
			SHEET NO. 62 OF 142

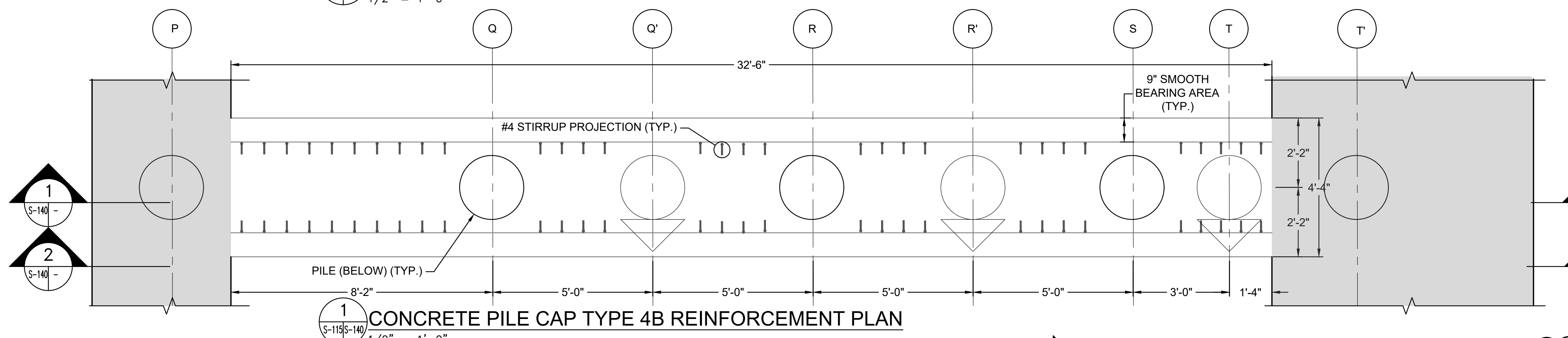
03/29/2024 09:55:00 AM C:\GZA\GIS\109\PROJECTS\109\109_PIER_PILE_SCHEDULE.dwg 1:14 PIER PILE TABLE March 29, 2024 VANESSA MALLOY

Pier Pile Schedule							
Location	Pile Cutoff Elevation (ft)	Batter	Estimated Bedrock Elevation (ft)	Rock Socket Length (ft)	MINIMUM Rock Anchor Length (ft)	ESTIMATED PILE LENGTH (ft)	Bid Length (ft)
AA13	3.68	0	-55.00	0	0	58.68	65
AA12	3.68	0	-56.00	0	0	59.68	65
A11	3.68	0	-56.00	0	0	59.68	65
A10	6.68	0	-56.00	0	0	62.68	65
B10	6.93	0	-57.00	0	0	63.93	70
B11	3.93	0	-57.00	0	0	60.93	70
B12	3.93	0	-57.00	0	0	60.93	70
B13	3.93	0	-57.00	0	0	60.93	70
C10	7.30	0	-58.00	0	0	65.30	70
C11	4.30	0	-58.00	0	0	62.30	70
C12	4.30	0	-58.00	0	0	62.30	70
C13	4.30	0	-58.00	0	0	62.30	70
D10	7.68	0	-60.00	0	0	67.68	75
D11	4.68	0	-60.00	0	0	64.68	70
D12	4.68	0	-60.00	0	0	64.68	70
D13	4.68	0	-60.00	0	0	64.68	70
E10	8.05	0	-61.00	0	0	69.05	75
E11	5.05	0	-61.00	0	0	66.05	75
E12	5.05	0	-61.00	0	0	66.05	75
E13	5.05	0	-61.00	0	0	66.05	75
F10	8.42	0	-63.00	0	0	71.42	80
F11	5.42	0	-63.00	0	0	68.42	75
F12	5.42	0	-63.00	0	0	68.42	75
F13	5.42	0	-63.00	0	0	68.42	75
G10	8.79	0	-64.00	0	0	72.79	80
G11	5.79	0	-64.00	0	0	69.79	75
G12	5.79	0	-64.00	0	0	69.79	75
G13	5.79	0	-64.00	0	0	69.79	75
G5	8.82	0	-67.00	0	0	75.82	85
G6	8.82	0	-66.00	0	0	74.82	80
G7	8.82	0	-66.00	0	0	74.82	80
G8	8.82	0	-65.00	0	0	73.82	80
G9	8.82	0	-65.00	0	0	73.82	80
H5	8.94	0	-68.00	0	0	76.94	85
H6	8.94	0	-67.00	0	0	75.94	85
H7	8.94	0	-67.00	0	0	75.94	85
H8	8.94	0	-66.00	0	0	74.94	80
H9	8.94	0	-66.00	0	0	74.94	80
H10	8.94	0	-66.00	0	0	74.94	80
H11	5.94	0	-66.00	0	0	71.94	80
H12	5.94	0	-66.00	0	0	71.94	80
H13	5.94	0	-66.00	0	0	71.94	80
I5	9.07	0	-69.00	0	0	78.07	85
I6	9.07	0	-69.00	0	0	78.07	85
I7	9.07	0	-68.00	0	0	77.07	85
I8	9.07	0	-67.00	0	0	76.07	85
I9	9.07	0	-67.00	0	0	76.07	85
I10	9.09	0	-67.00	5	0	81.09	90
I11	6.09	0	-67.00	5	0	78.09	85
I12	6.09	0	-67.00	5	0	78.09	85
I13	6.09	0	-67.00	5	0	78.09	85
J10	9.46	0	-69.00	5	0	83.46	90
J11	6.46	0	-69.00	5	0	80.46	90
J12	6.46	0	-69.00	5	0	80.46	90
J13	6.46	0	-69.00	5	0	80.46	90
K10	9.84	0	-70.00	5	0	84.84	90
K11	6.84	0	-70.00	5	0	81.84	90
K12	6.84	0	-70.00	5	0	81.84	90
K13	6.84	0	-70.00	5	0	81.84	90
L10	10.21	0	-72.00	5	0	87.21	90
L11	7.21	0	-72.00	5	0	84.21	90
L12	7.21	0	-72.00	5	0	84.21	90
L13	7.21	0	-72.00	5	0	84.21	90
M10	10.58	0	-73.00	5	0	88.58	95
M11	7.58	0	-73.00	5	0	85.58	95
M12	7.58	0	-73.00	5	0	85.58	95
M13	7.58	0	-73.00	5	0	85.58	95
N10	10.95	0	-75.00	5	0	90.95	95
N11	7.95	0	-75.00	5	0	87.95	95
N12	7.95	0	-75.00	5	0	87.95	95
N13	7.95	0	-75.00	5	0	87.95	95
O10	11.32	0	-76.00	5	0	92.32	95
O11	8.32	0	-76.00	5	0	89.32	95
O12	8.32	0	-76.00	5	0	89.32	95
O13	8.32	0	-76.00	5	0	89.32	95
P1	9.60	0	-86.00	5	0	100.60	110
P1B	9.60	3:12	-86.00	0	20	98.54	105
P2	9.60	0	-86.00	5	0	100.60	110
P2B	9.60	3:12	-85.00	0	20	97.51	105
P3	9.60	0	-85.00	5	0	99.60	105
P3B	9.60	3:12	-84.00	0	2	96.48	100
P4	9.60	0	-84.00	5	0	98.60	105
P4B	9.60	3:12	-83.00	0	20	95.45	105
P5	9.60	0	-83.00	5	0	97.60	105
P5B	9.60	3:12	-82.00	0	20	94.42	100
P6	9.60	0	-82.00	5	0	96.60	105
P6B	9.60	3:12	-81.00	0	20	93.39	100
P7	9.60	0	-81.00	5	0	95.60	105
P7B	9.60	3:12	-80.00	0	20	92.36	100
P8	9.60	0	-80.00	5	0	94.60	100
P8B	9.60	3:12	-79.00	0	20	91.33	100
P9	9.60	0	-79.00	5	0	93.60	100
P9B	9.60	3:12	-79.00	0	20	91.33	100

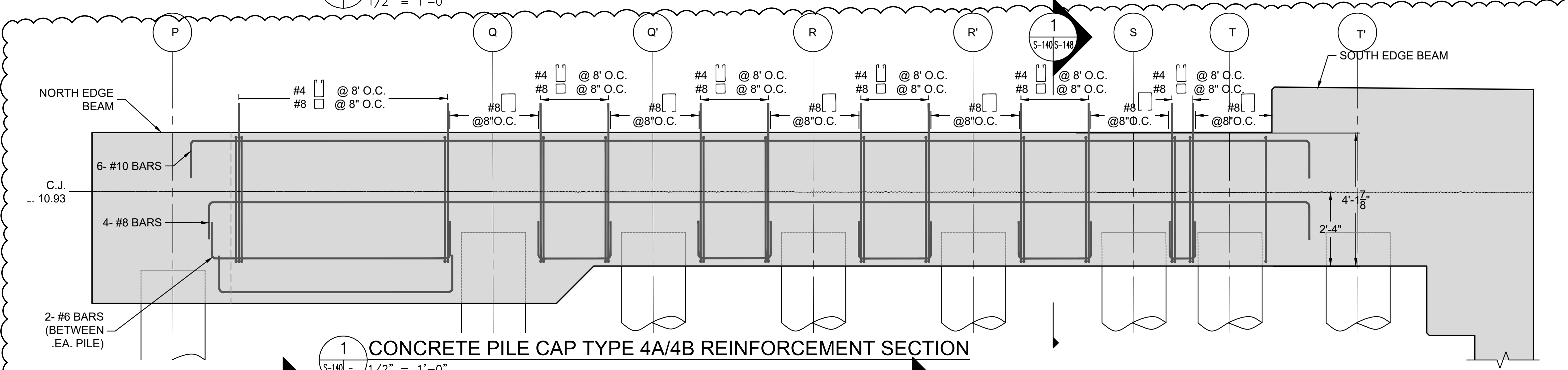
Pier Pile Schedule							
Location	Pile Cutoff Elevation (ft)	Batter	Estimated Bedrock Elevation (ft)	Rock Socket Length (ft)	MINIMUM Rock Anchor Length (ft)	ESTIMATED PILE LENGTH (ft)	Bid Length (ft)
P10	9.60	0	-78.00	5	0	92.60	100
P11	8.43	0	-77.00	5	0	90.43	100
P12	8.43	0	-76.00	5	0	89.43	95
P13	6.10	0	-75.00	5	0	86.10	95
P13B	6.10	3:12	-75.00	0	20	83.60	90
P14	6.10	0	-74.00	5	0	85.10	90
P14B	6.10	3:12	-74.00	0	20	82.57	90
P15	6.10	0	-73.00	5	0	84.10	90
P15B	6.10	3:12	-73.00	0	20	81.53	90
P16	6.10	0	-72.00	5	0	83.10	90
P16B	6.10	3:12	-72.00	0	20	80.50	90
P17	6.10	0	-71.00	5	0	82.10	90
P17B	6.10	3:12	-71.00	0	20	79.47	85
P18	6.10	0	-70.00	5	0	81.10	90
P18B	6.10	3:12	-70.00	0	20	78.44	85
P19	8.43	0	-69.00	5	0	82.43	90
P19B	8.43	3:12	-69.00	0	20	79.81	85
P20	8.43	0	-68.00	5	0	81.43	90
P20B	8.43	3:12	-68.00	0	20	78.78	85
P21	8.43	0	-67.00	5	0	80.43	90
P21B	8.43	3:12	-68.00	0	20	78.78	85
P22	9.60	0	-66.00	5	0	80.60	90
P22B	9.60	3:12	-66.00	0	20	77.93	85
P23	9.60	0	-65.00	5	0	79.60	85
P23B	9.60	3:12	-65.00	0	20	76.90	85
P24	9.60	0	-65.00	5	0	79.60	85
Q1	9.59	0	-67.00	5	0	101.59	110
Q2	11.43	0	-67.00	5	0	103.43	110
Q3	11.43	0	-66.00	5	0	102.43	110
Q4	9.59	0	-65.00	5	0	99.59	105
Q5	11.43	0	-64.00	5	0	100.43	110
Q6	11.43	0	-63.00	5	0	99.43	105
Q7	11.43	0	-62.00	5	0	98.43	105
Q8	11.43	0	-60.00	5	0	96.43	105
Q9	11.43	0	-79.00	5	0	95.43	105
Q10	11.43	0	-79.00	5	0	95.43	105
Q11	8.43	0	-78.00	5	0	91.43	100
Q12	8.43	0	-77.00	5	0	90.43	100
Q13	8.43	0	-76.00	5	0	89.43	95
Q14	8.43	0	-75.00	5	0	88.43	95
Q15	8.43	0	-74.00	5	0	87.43	95
Q16	8.43	0	-73.00	5	0	86.43	95
Q17	8.43	0	-72.00	5	0	85.43	95
Q18	8.43	0	-71.00	5	0	84.43	90
Q19	8.43	0	-70.00	5	0	83.43	90
Q20	8.43	0	-69.00	5	0	82.43	90
Q21	9.59	0	-68.00	5	0	82.59	90
Q22	11.43	0	-67.00	5	0	83.43	90
Q23	11.43	0	-66.00	5	0	82.43	90
Q24	9.59	0	-66.00	5	0	80.59	90
Q1'B	9.59	3:12	-88.00	0	20	100.60	110
Q1'B	9.59	3:12	-85.00	0	20	97.50	105
Q1'12B	8.43	3:12	-77.00	0	20	88.06	95
Q2'12B	9.59	3:12	-69.00	0	20	81.01	90
Q2'4B	9.59	3:12	-66.00	0	20	77.92	85
R1	9.59	0	-88.00	5	0	102.59	110
R2	11.43	0	-88.00	5	0	104.43	110
R3	11.43	0	-87.00	5	0	103.43	110
R4	9.59	0	-86.00	5	0	100.59	110
R5	11.43	0	-85.00	5	0	101.43	110
R6	11.43	0	-83.00	5	0	99.43	105
R7	11.43	0	-82.00	5	0	98.43	105
R8	11.43	0	-81.00	5	0	97.43	105
R9	11.43	0	-80.00	5	0	96.43	105
R10	11.43	0	-80.00	5	0	96.43	105
R11	8.43	0	-79.00	5	0	92.43	100
R12	8.43	0	-78.00	5	0	91.43	100
R13	11.43	0	-77.00	5	0	93.43	100
R14	11.43	0	-76.00	5	0	92.43	100
R15	11.43	0	-75.00	5	0	91.43	100
R16	11.43	0	-74.00	5	0	90.43	100
R17	11.43	0	-73.00	5	0	89.43	95
R18	11.43	0	-72.00	5	0	88.43	95
R19	8.43	0	-71.00	5	0	84.43	90
R20	8.43	0	-70.00	5	0	83.43	90
R21	9.59	0	-69.00	5	0	83.59	90
R22	11.43	0	-68.00	5	0	84.43	90
R23	11.43	0	-67.00	5	0	83.43	90
R24	9.59	0	-67.00	5	0	81.59	90
R1'	9.59	3:12	-89.00	0	20	101.63	110
R4'	9.59	3:12	-86.00	0	20	98.54	105
R1'11	8.43	3:12	-79.00	0	20	90.12	100
R1'12	8.43	3:12	-78.00	0	20	89.09	95
R2'1	9.59	3:12	-70.00	0	20	82.04	90
R2'4	9.59	3:12	-67.00				



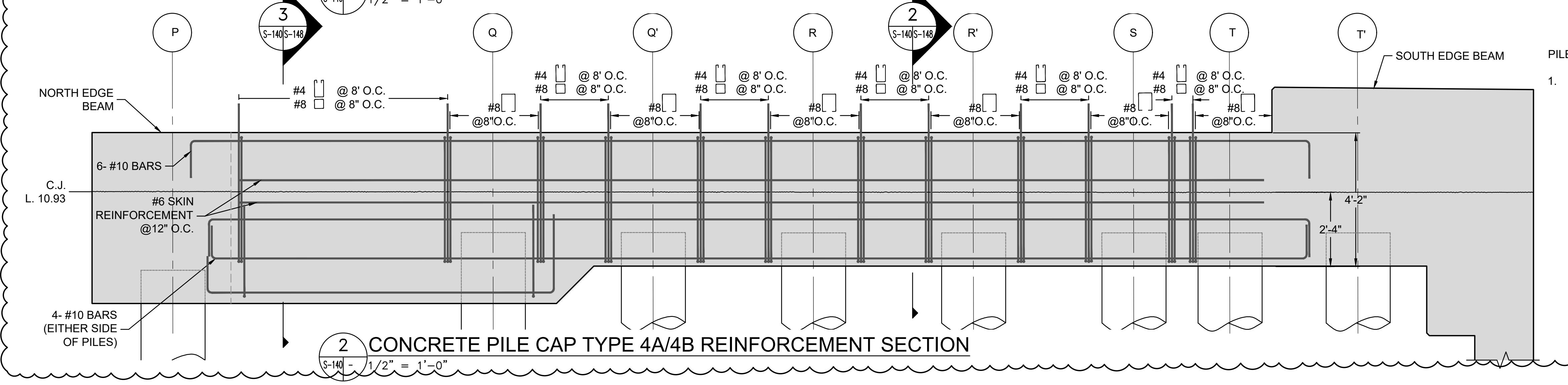
1
S-140
S-115S-140
CONCRETE PILE CAP TYPE 4A REINFORCEMENT PLAN
1/2" = 1'-0"



1
S-140
S-115S-140
CONCRETE PILE CAP TYPE 4B REINFORCEMENT PLAN
1/2" = 1'-0"



1
S-140
S-140S-148
CONCRETE PILE CAP TYPE 4A/4B REINFORCEMENT SECTION
1/2" = 1'-0"



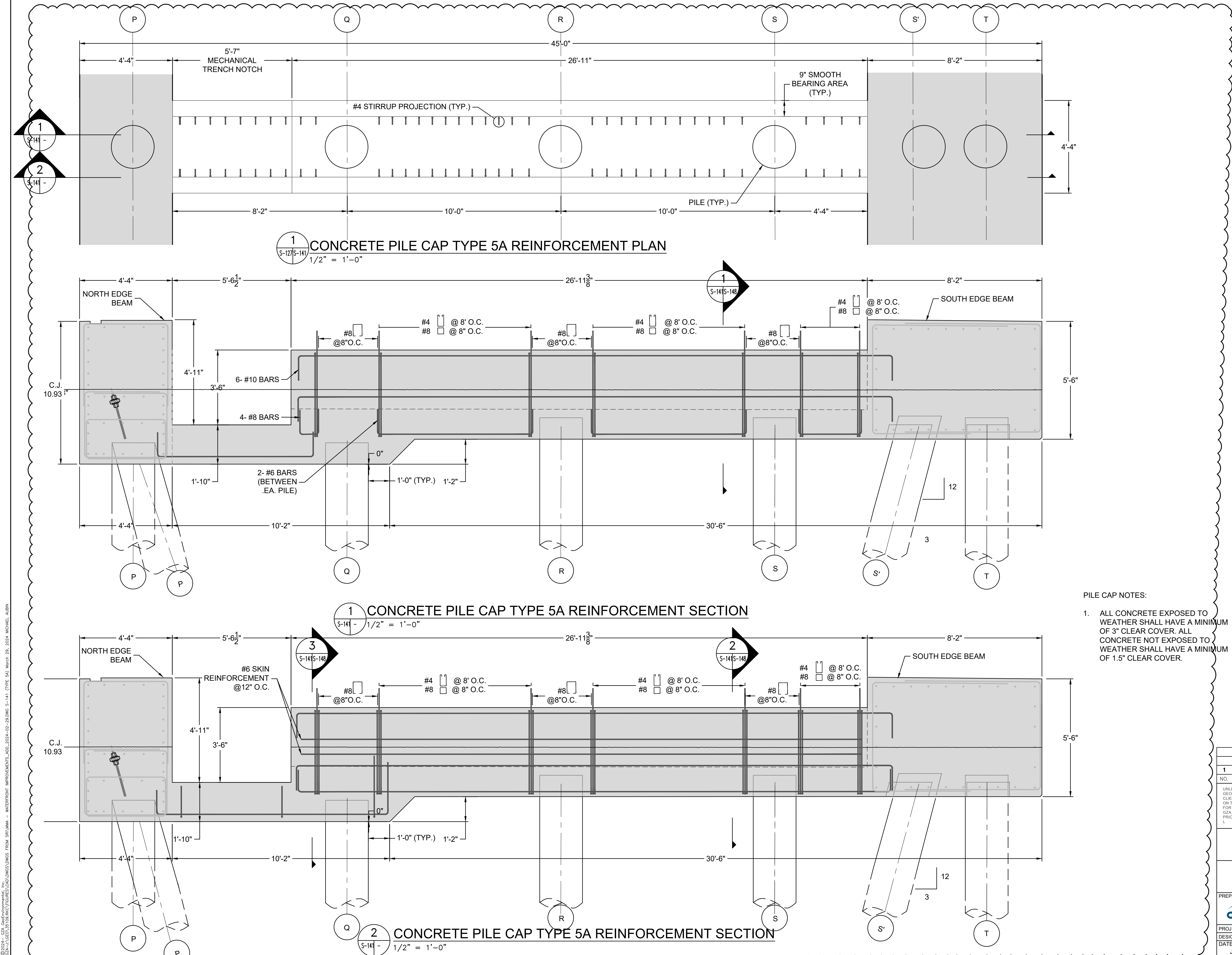
2
S-140
S-140S-148
CONCRETE PILE CAP TYPE 4A/4B REINFORCEMENT SECTION
1/2" = 1'-0"

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

- PILE CAP NOTES:
- ALL CONCRETE EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 3" CLEAR COVER. ALL CONCRETE NOT EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 1.5" CLEAR COVER.

2		ADDENDUM #7	DDF	3/29/2024
1		ADDENDUM #6	DDF	3/22/2024
NO.	ISSUE/DESCRIPTION		BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.				
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE				
CAST-IN-PLACE PIER PILE CAP DETAILS - TYPE 4A/4B				
PREPARED BY: GZA www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME		
PROJ MGR: RKC	DESIGNED BY: MAR	REVIEWED BY: BDW	CHECKED BY:	DRAWING
DATE: JANUARY 2024	PROJECT NO. 03.0035109.00	SCALE:	REVISION NO.	S-140
				SHEET NO. 69 OF 142

© 2024 GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_2024-02-29.DWG S-140 (TYPE 4A-4B) March 29, 2024 MICHAEL WILSON



1 CONCRETE PILE CAP TYPE 5A REINFORCEMENT PLAN
S-1275-141
1/2" = 1'-0"

1 CONCRETE PILE CAP TYPE 5A REINFORCEMENT SECTION
S-1415-148
1/2" = 1'-0"

2 CONCRETE PILE CAP TYPE 5A REINFORCEMENT SECTION
S-1415-148
1/2" = 1'-0"

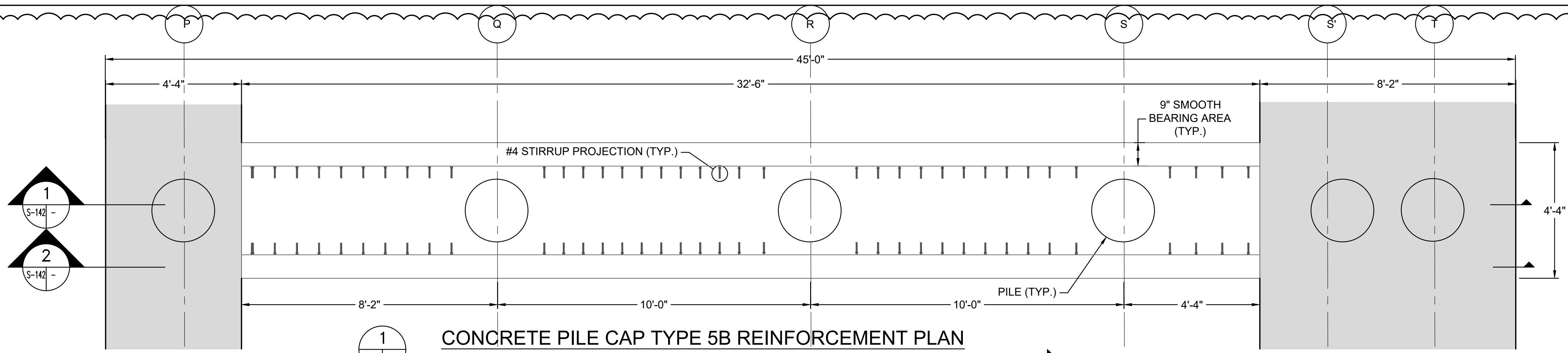
- PILE CAP NOTES:
- ALL CONCRETE EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 3" CLEAR COVER. ALL CONCRETE NOT EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 1.5" CLEAR COVER.

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

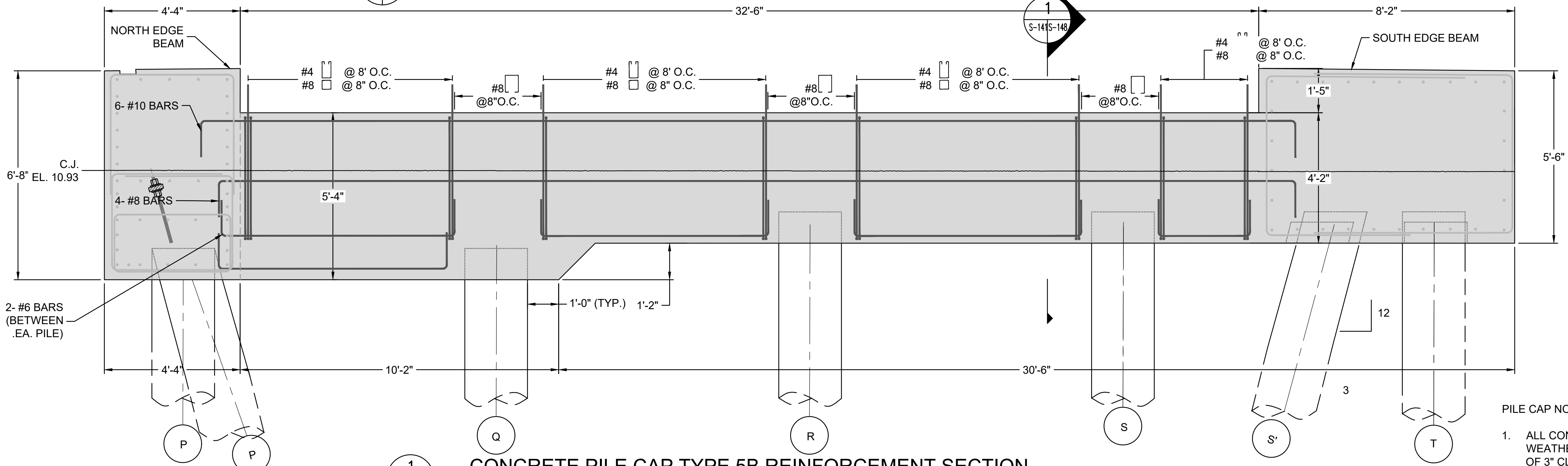
ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
CAST-IN-PLACE PIER PILE CAP DETAILS - TYPE 5A			
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME	
PROJ MGR: RKC	REVIEWED BY: BDW	CHECKED BY: BDW	DRAWING SCALE: S-141
DESIGNED BY: MAR	DRAWN BY: BDW	SCALE: REVISION NO.	SHEET NO. 70 OF 142
DATE: JANUARY 2024	PROJECT NO. 03.0035109.00		

© 2024 GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG: S-141 (TYPE: 5A) March 29, 2024 MICHAEL ALBIN

© 2024 GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG S-142 (TYPE 5B) March 29, 2024 MICHAEL WERN

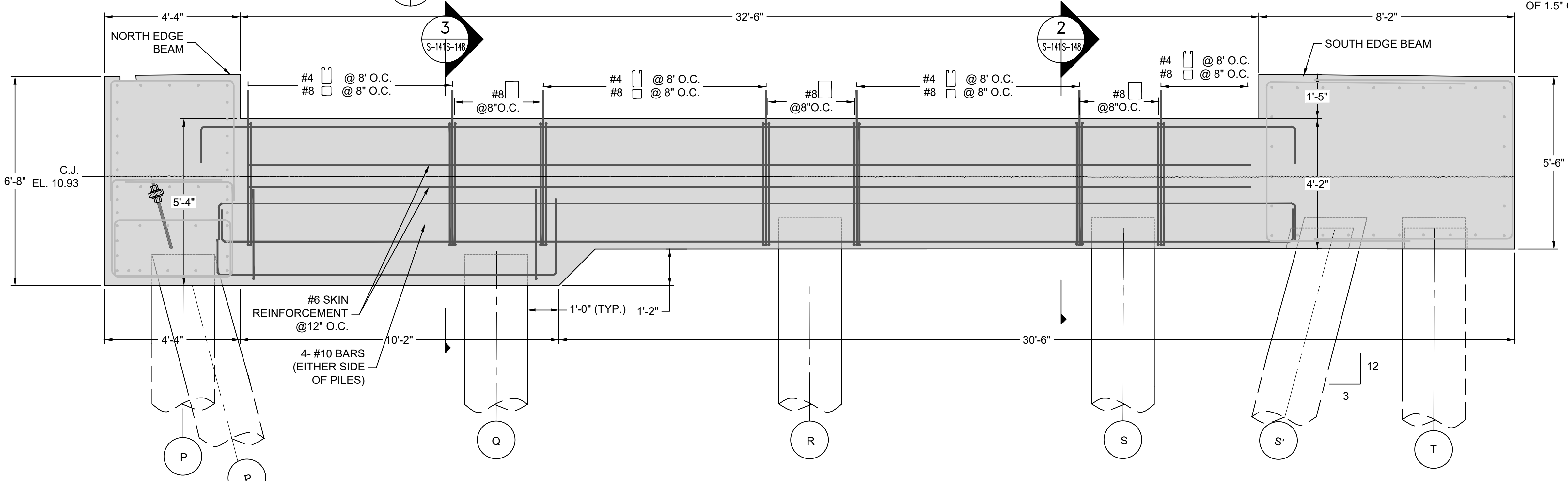


CONCRETE PILE CAP TYPE 5B REINFORCEMENT PLAN
1/2" = 1'-0"



CONCRETE PILE CAP TYPE 5B REINFORCEMENT SECTION
1/2" = 1'-0"

- PILE CAP NOTES:**
- ALL CONCRETE EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 3" CLEAR COVER. ALL CONCRETE NOT EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 1.5" CLEAR COVER.



CONCRETE PILE CAP TYPE 5B REINFORCEMENT SECTION
1/2" = 1'-0"

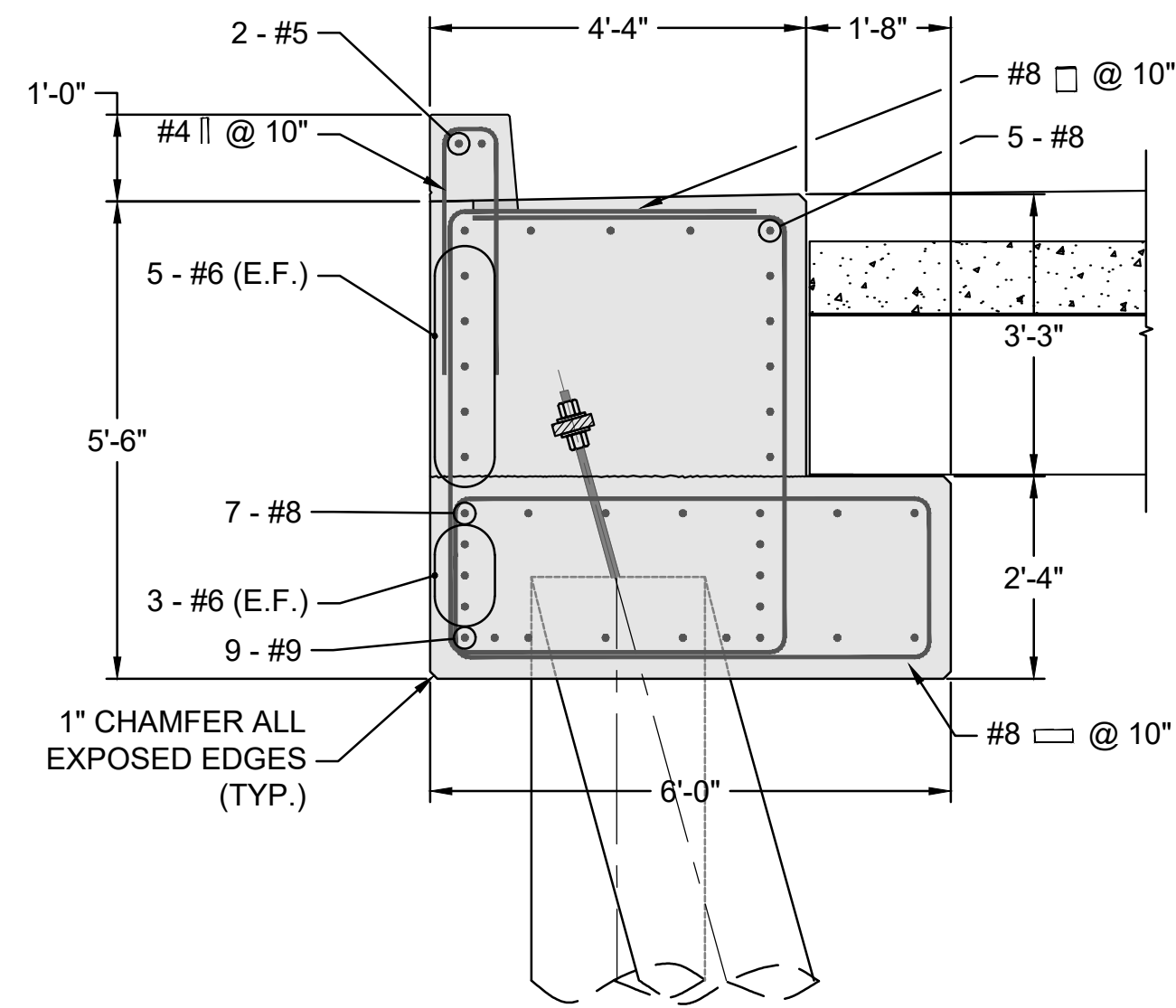
1

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

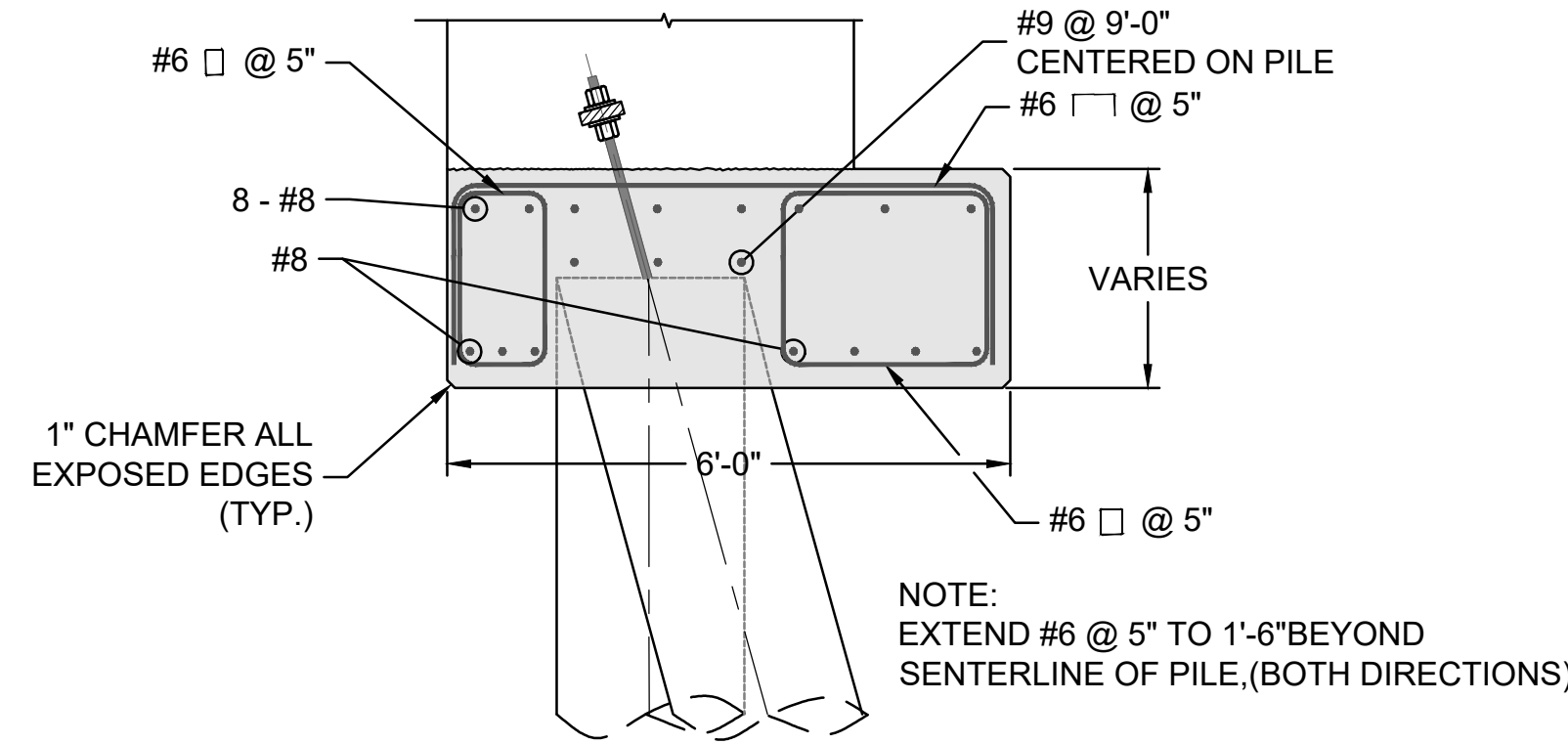
ADDENDUM #7		DOF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
1			

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE	
CAST-IN-PLACE PIER PILE CAP DETAILS - TYPE 5B	
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: BDW DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY: SCALE: REVISION NO.	DRAWING S-142 SHEET NO. 71 OF 142

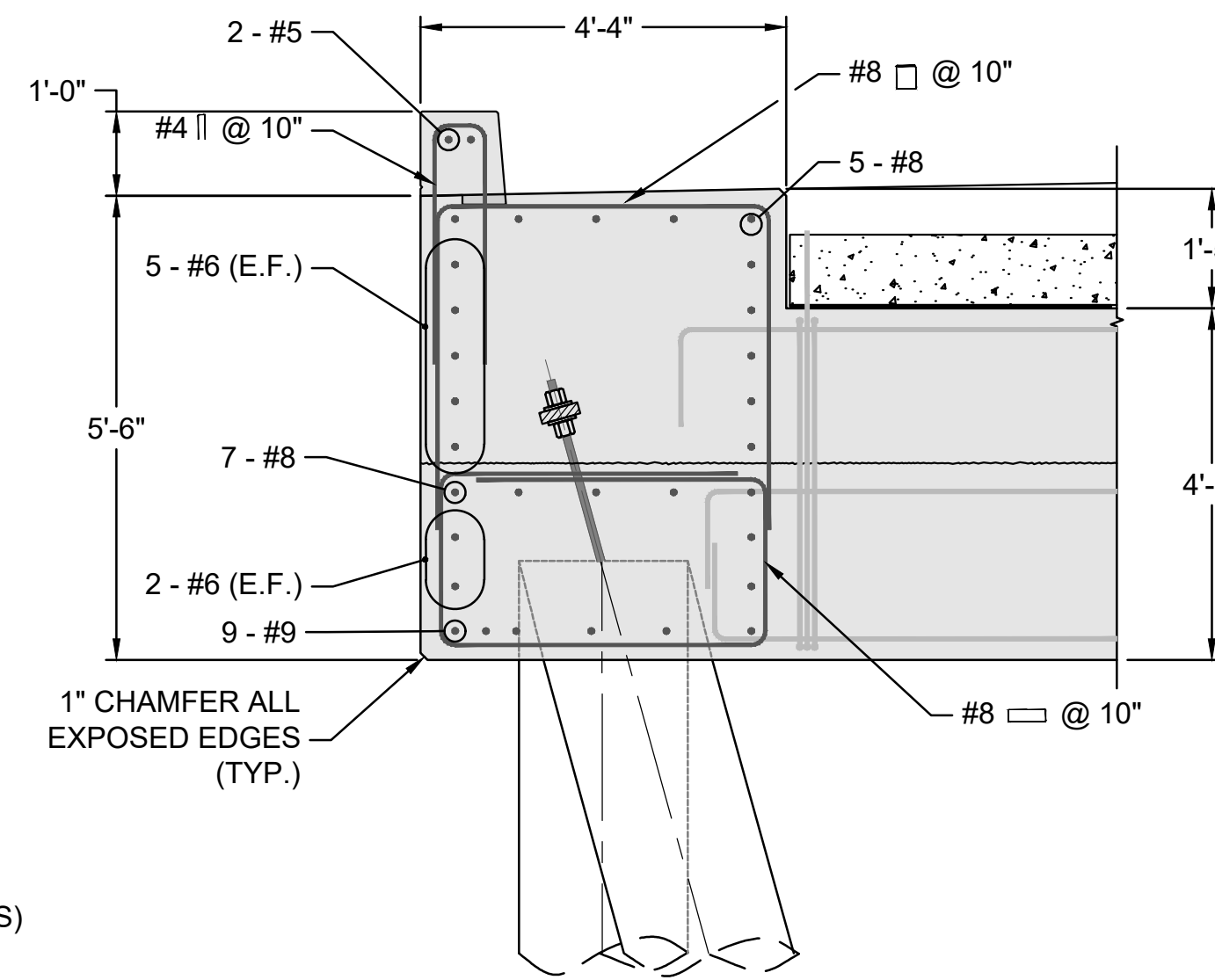


A SECTION - NORTH EDGE BEAM @ BENT 3
 S-119/S-146 1/4" = 1'-0"

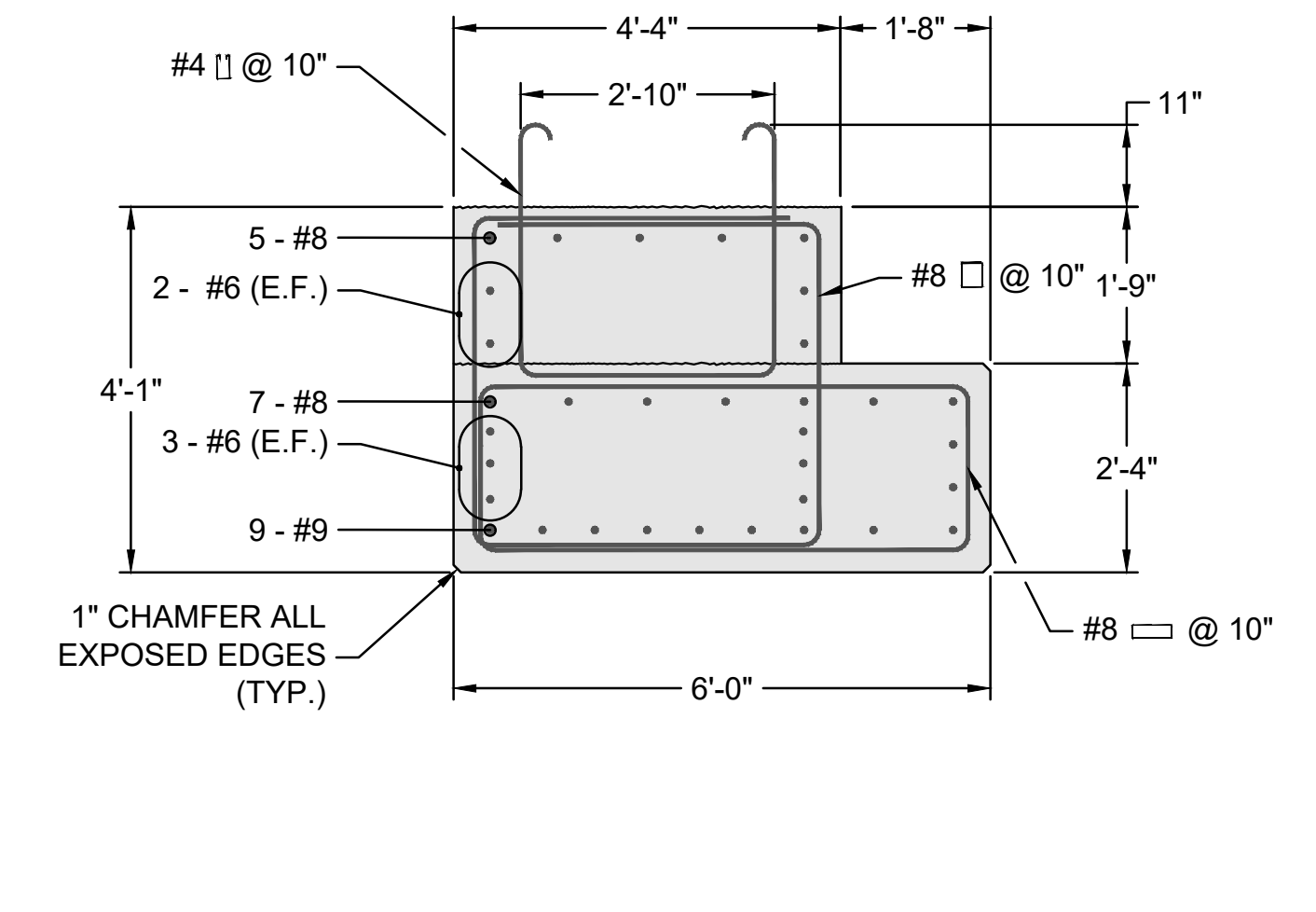


A' SECTION - NORTH EDGE BEAM @ ALL PILE BENTS
 S-119/S-146 1/4" = 1'-0"

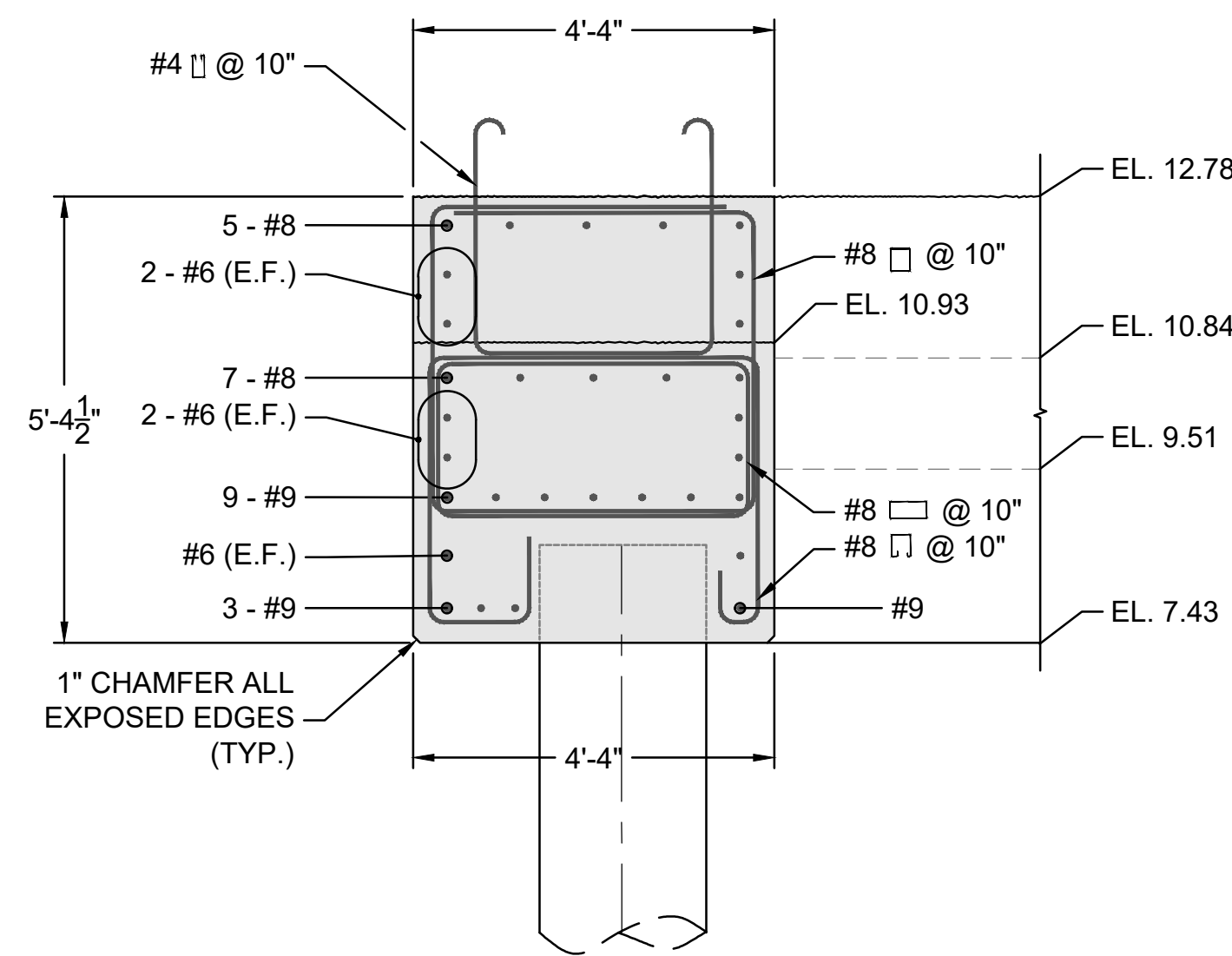
NOTE:
 EXTEND #6 @ 5" TO 1'-6" BEYOND
 CENTERLINE OF PILE, (BOTH DIRECTIONS)



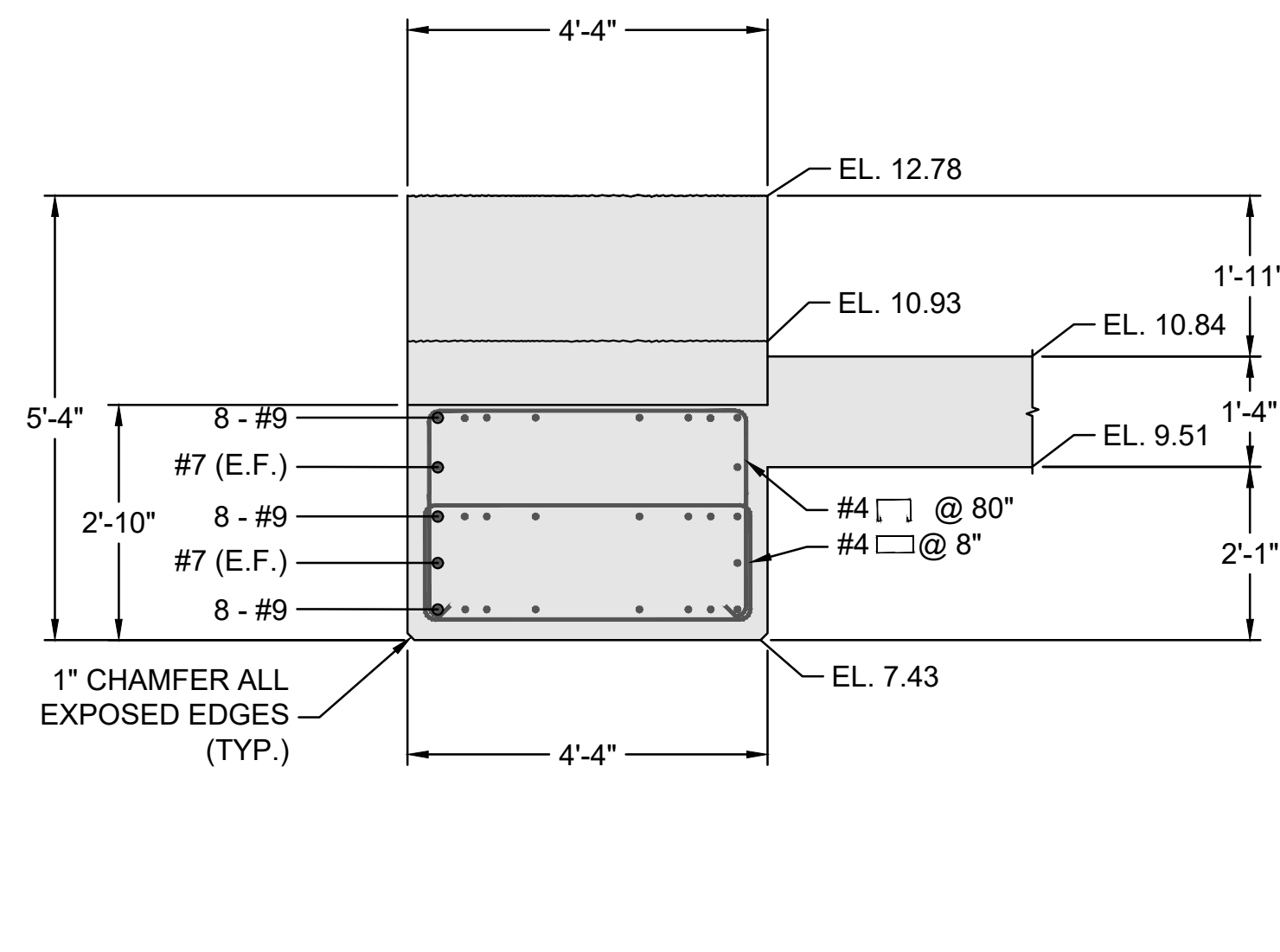
B SECTION - NORTH EDGE BEAM @ BENT 4
 S-119/S-146 1/4" = 1'-0"



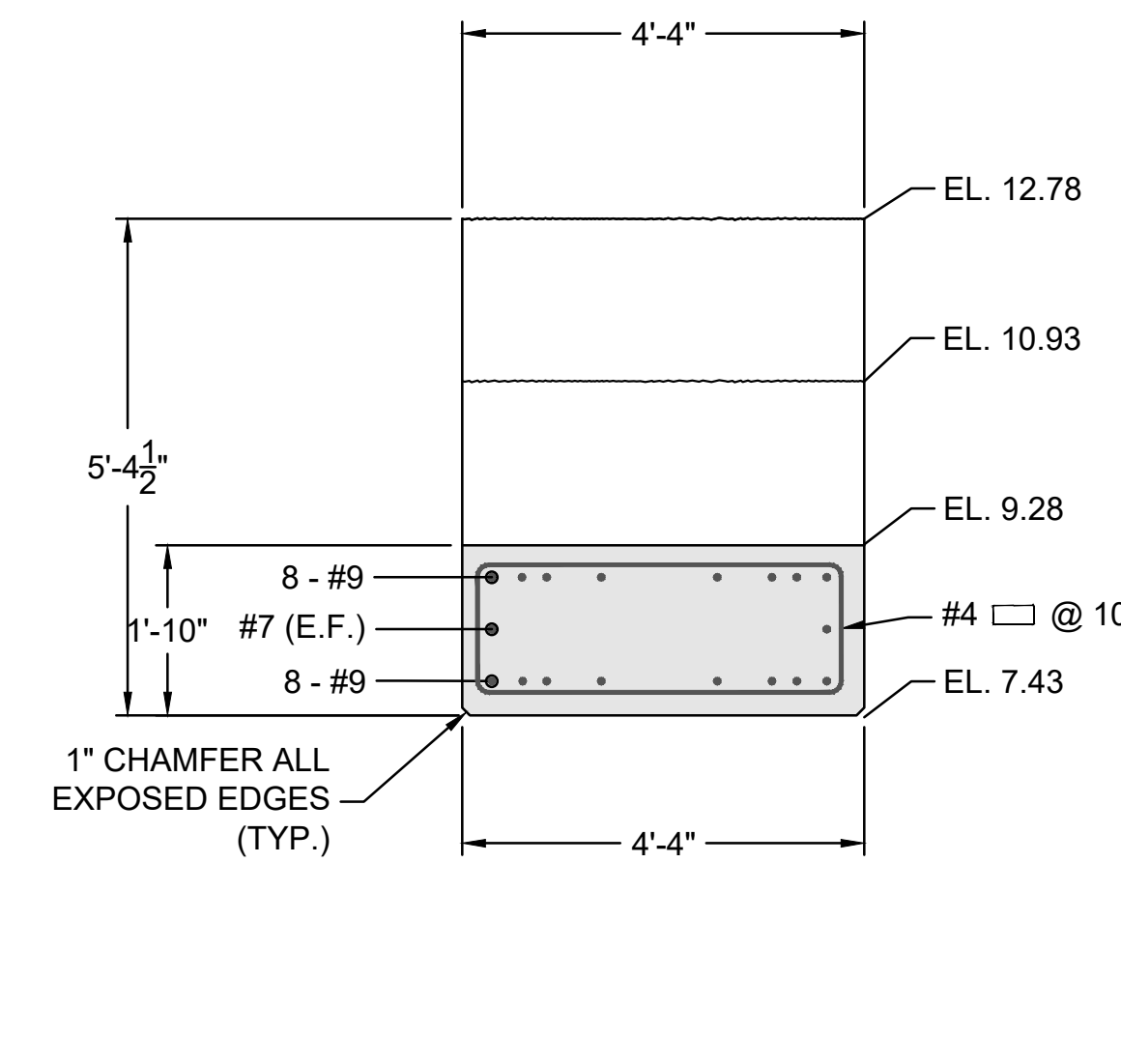
C SECTION - NORTH EDGE BEAM @ BENT 10 - 11
 S-119/S-146 1/4" = 1'-0"



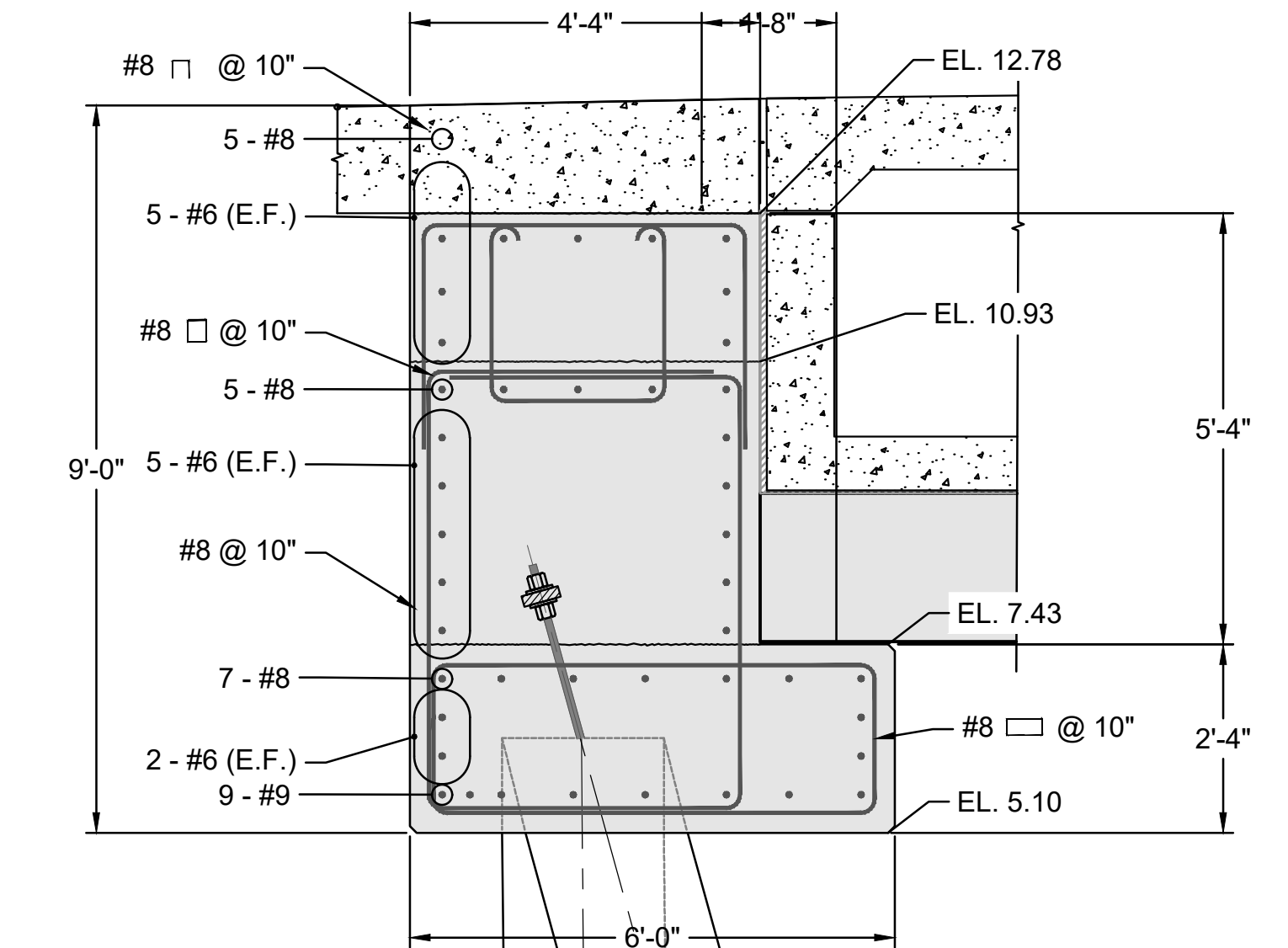
D SECTION - NORTH EDGE BEAM @ BENT 11
 S-119/S-146 1/4" = 1'-0"



E SECTION - NORTH EDGE BEAM @ M. TRENCH
 S-119/S-146 1/4" = 1'-0"



F SECTION - NORTH EDGE BEAM @ E. TRENCH
 S-119/S-146 1/4" = 1'-0"



G SECTION - NORTH EDGE BEAM @ BENT 13
 S-119/S-146 1/4" = 1'-0"

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

NO.	ISSUE/DESCRIPTION	BY	DATE
1	ADDENDUM #7	DDF	3/29/2024

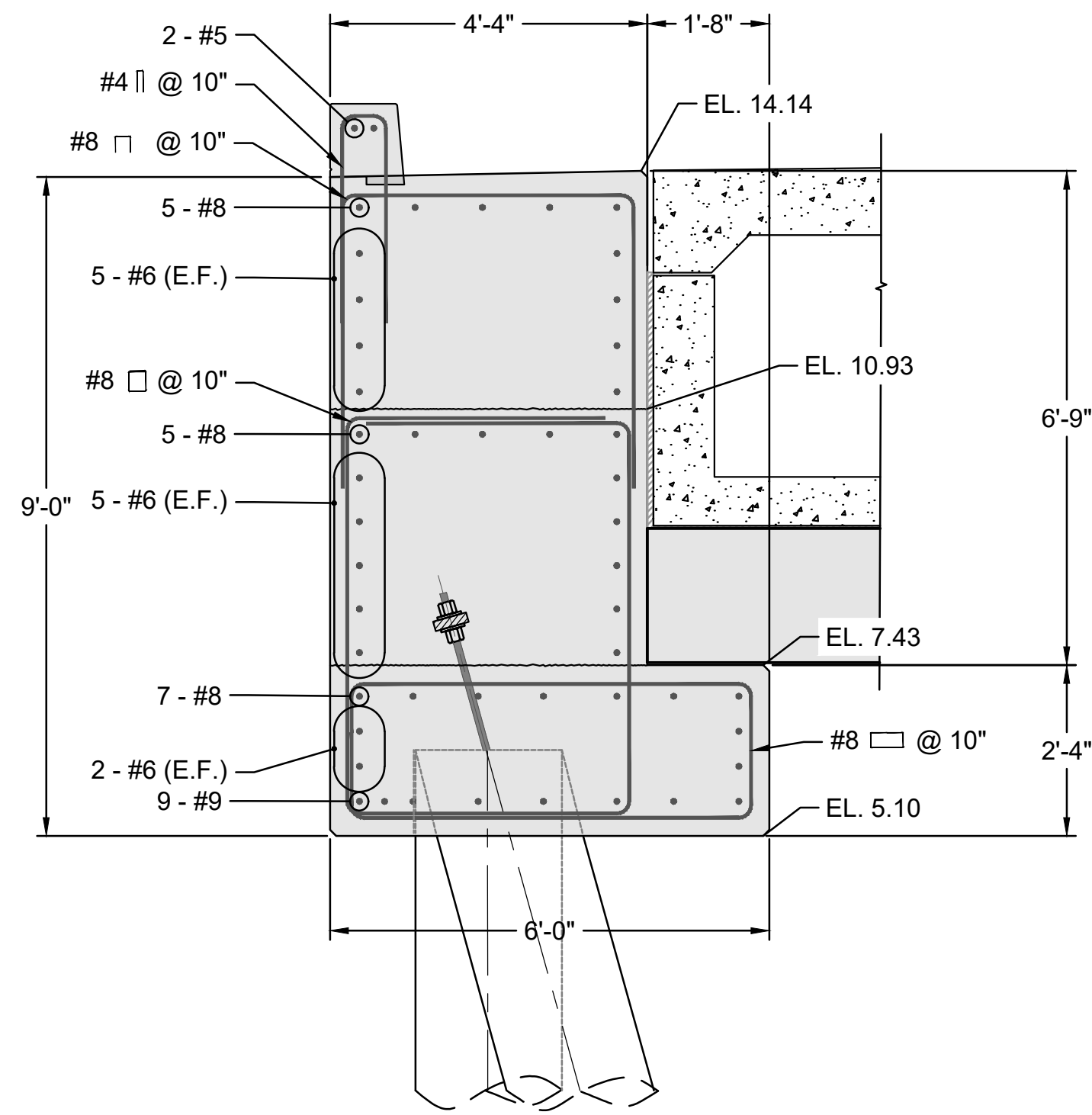
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEDENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

MAINE MARITIME ACADEMY WATERFRONT CAMPUS
 PIER UPGRADES AND WATERFRONT IMPROVEMENTS
 CASTINE, MAINE

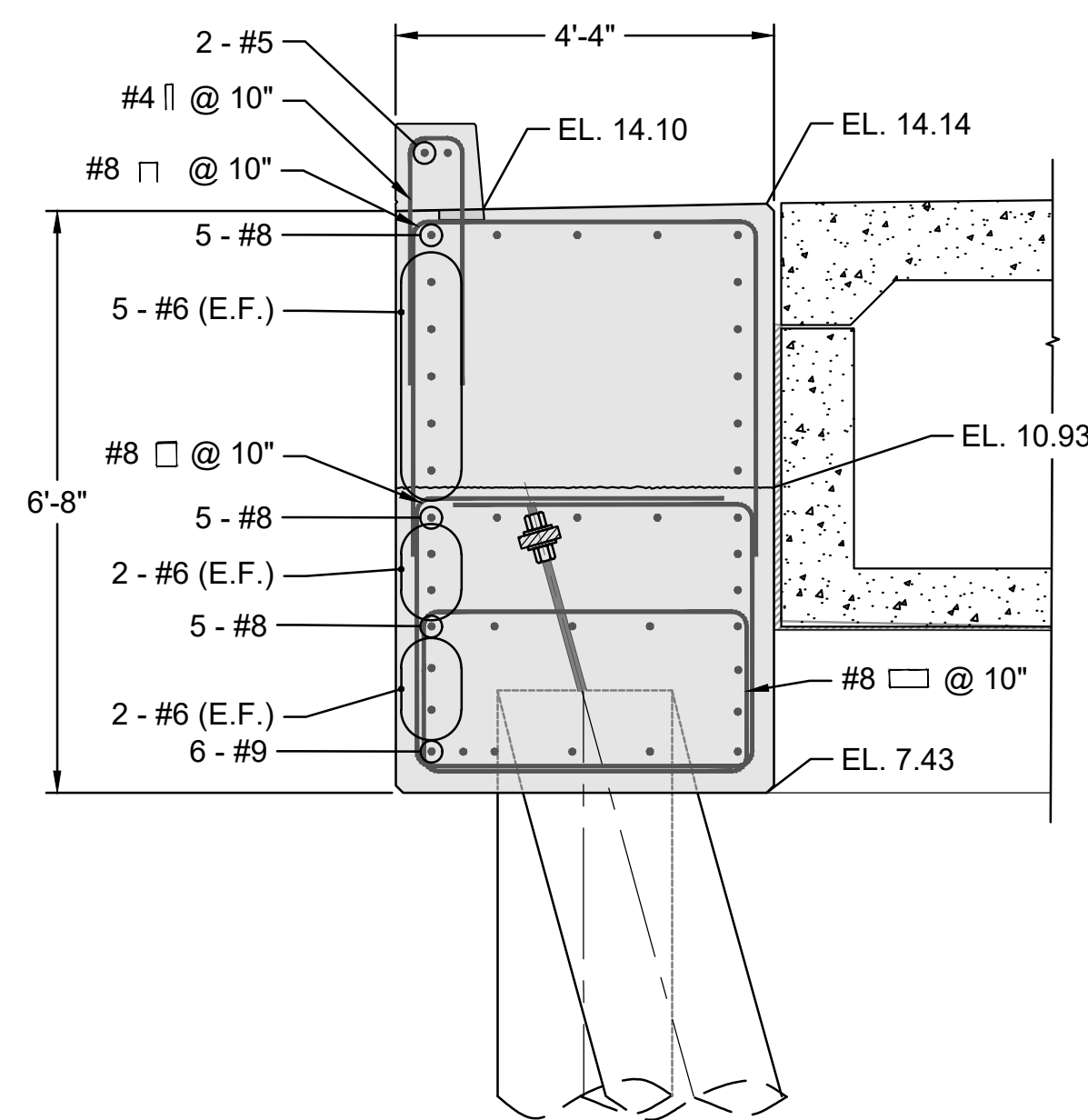
NORTH EDGE BEAM DETAILS

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY:	SCALE: REVISION NO.

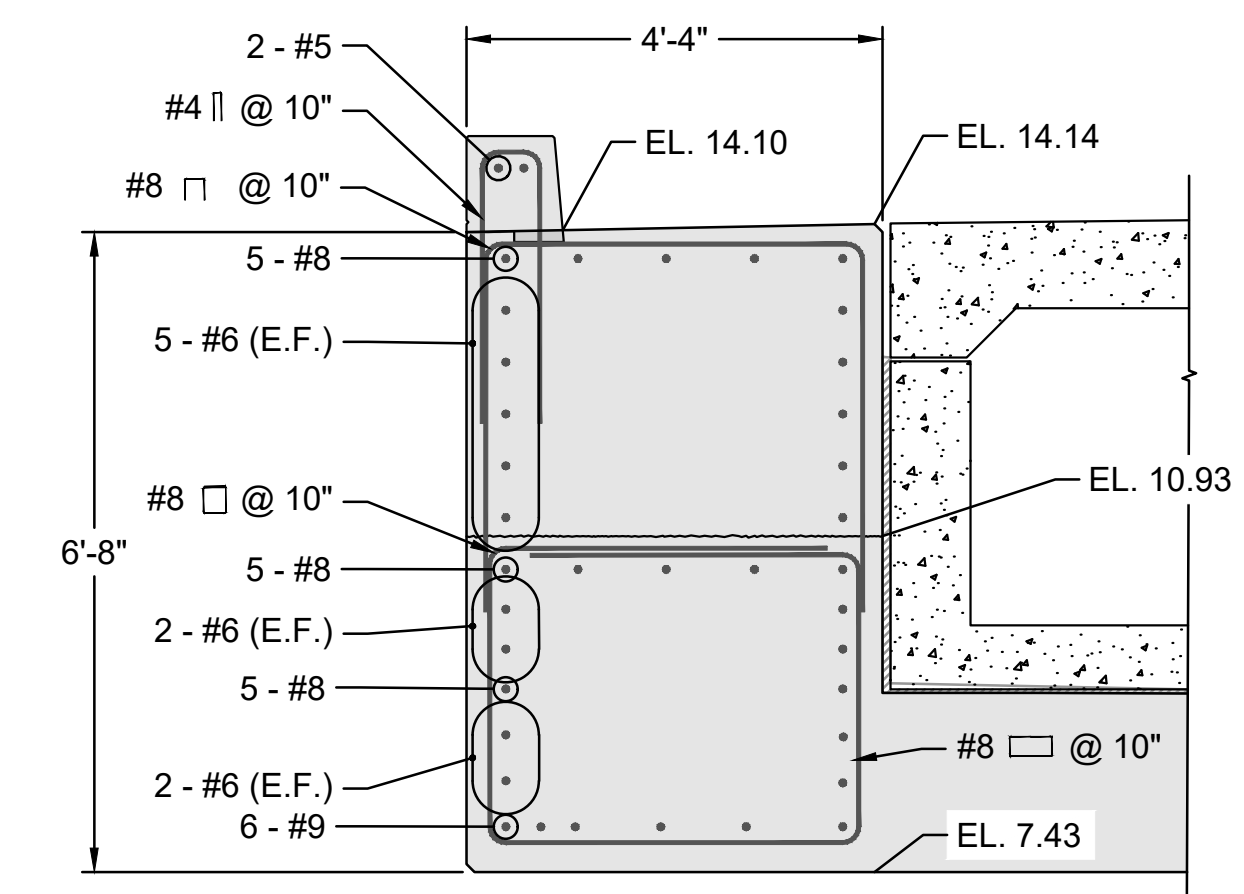
DRAWING
S-146
 SHEET NO. 75 OF 142



H SECTION - NORTH EDGE BEAM @ BENT 14
 S-119/S-147 1/4" = 1'-0"



I SECTION - NORTH EDGE BEAM @ BENT 18 - 19
 S-119/S-147 1/4" = 1'-0"



J SECTION - NORTH EDGE BEAM @ BENT 19 - 20 (CAPS 5A/5B)
 S-119/S-147 1/4" = 1'-0"

1

I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024

NO.	ISSUE/DESCRIPTION	BY	DATE
1	ADDENDUM #7	DDF	3/29/2024

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

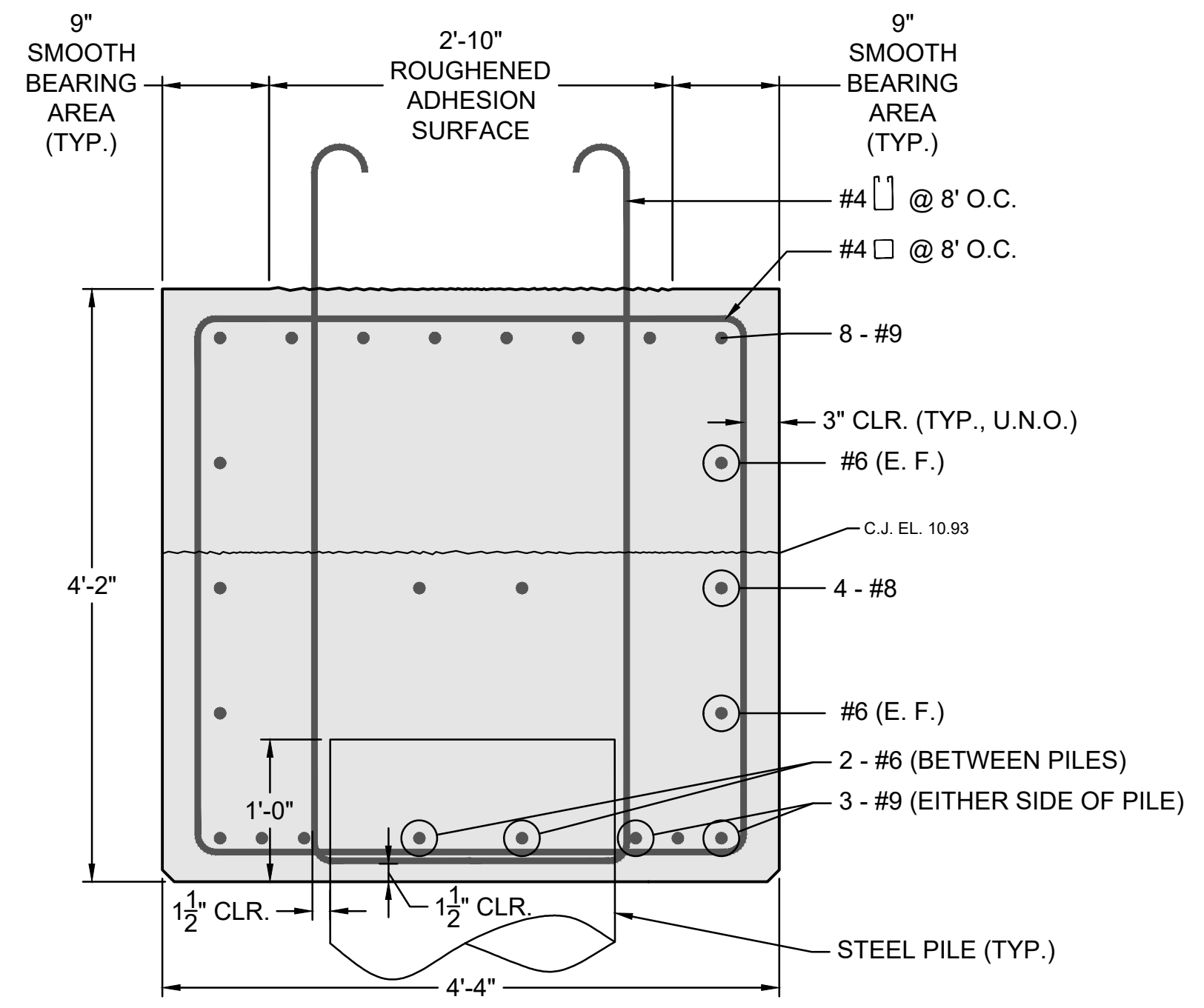
**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
 PIER UPGRADES AND WATERFRONT IMPROVEMENTS
 CASTINE, MAINE**

EDGE BEAM SECTIONS AND DETAILS - 1

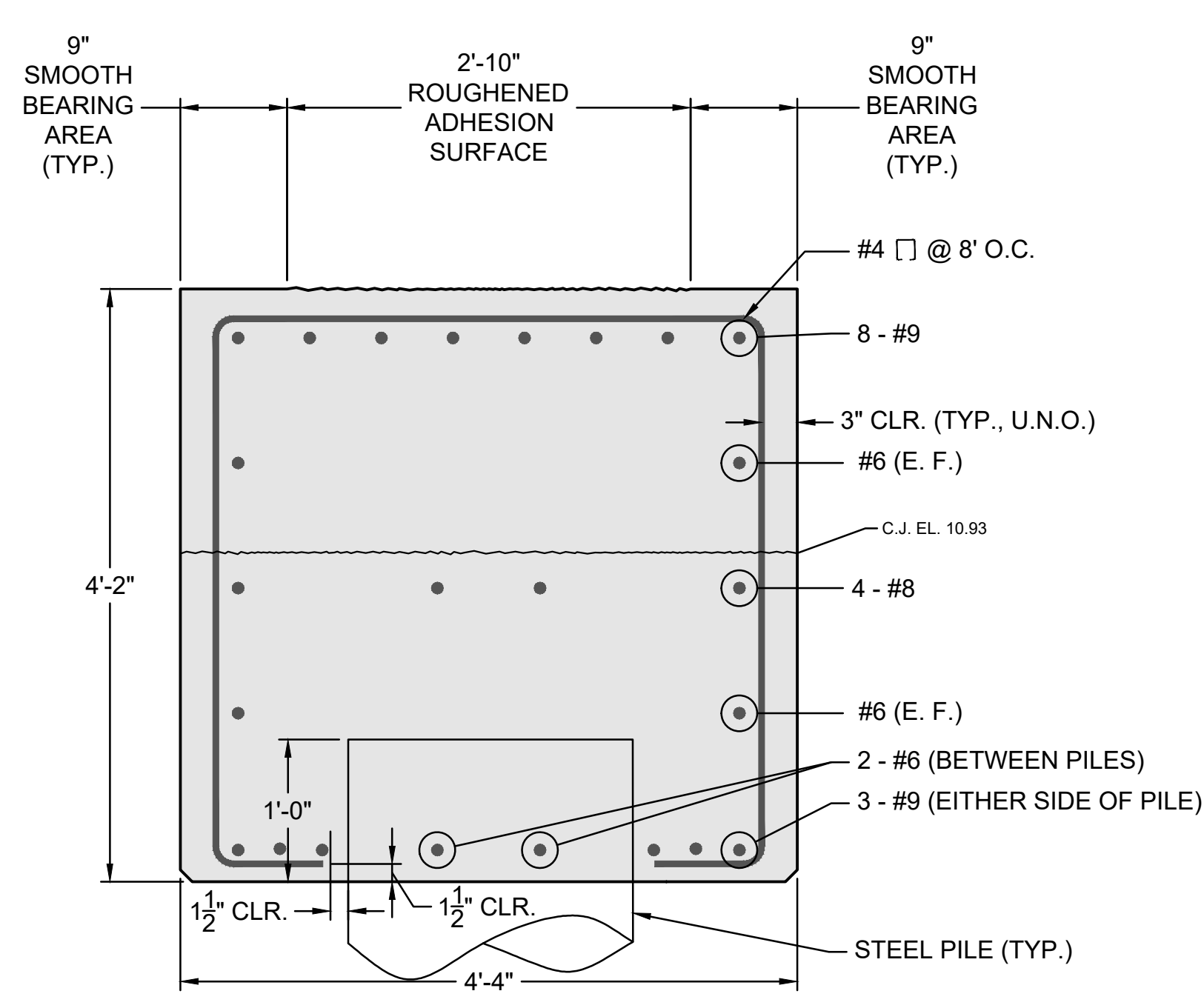
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: BDW DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY: SCALE:	DRAWING REVISION NO.

S-147
 SHEET NO. 78 OF 142

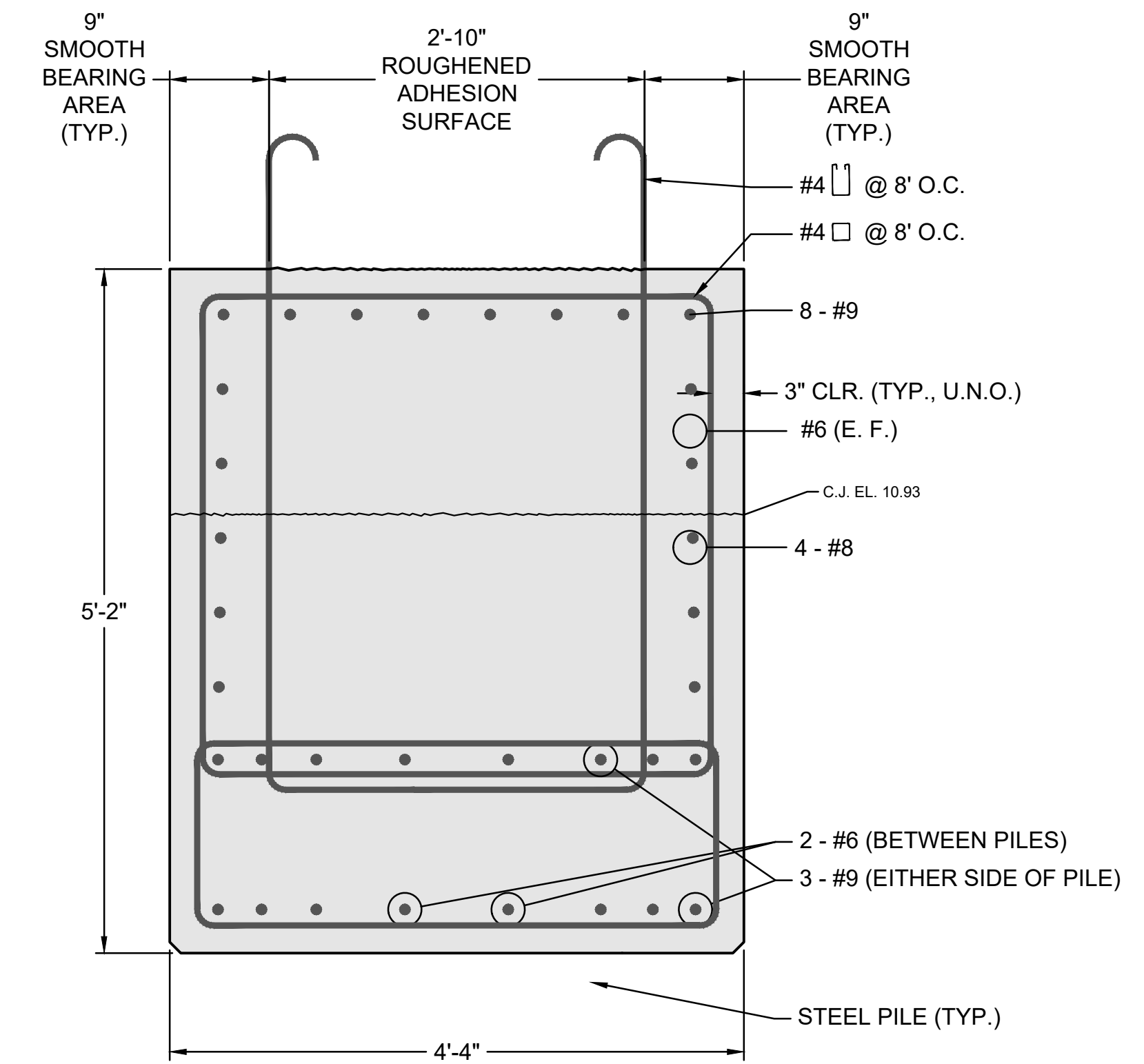
© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG S-147 DTLS. (EDGE BEAM) (I) Month 27, 2024. MICHAEL AUBIN



1 CONCRETE PILE CAP TYPE 4A/4B/5A/5B SECTION
 $\frac{S-144(S-141)}{S-142} \frac{1}{2} = 1'-0"$



2 CONCRETE PILE CAP TYPE 4A/4B/5A/5B SECTION
 $\frac{S-144(S-141)}{S-142} \frac{1}{2} = 1'-0"$



3 CONCRETE PILE CAP TYPE 4A/4B/5A/5B SECTION
 $\frac{S-144(S-141)}{S-142} \frac{1}{2} = 1'-0"$

1

PILE CAP NOTES:

- ALL CONCRETE EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 3" CLEAR COVER. ALL CONCRETE NOT EXPOSED TO WEATHER SHALL HAVE A MINIMUM OF 1.5" CLEAR COVER.
- FABRICATOR TO LOCATE ALL CONNECTION DOWEL BAR LOCATIONS.
- FOR PILE CAP TO PILE CAP CONNECTIONS, SEE SHEET S-128.
- FOR PILE CAP TO CROSSOVER BEAM CONNECTION, SEE SHEETS S-127 AND S-129.

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

NO.	ISSUE/DESCRIPTION	BY	DATE
1	ADDENDUM #7	DDF	3/29/2024

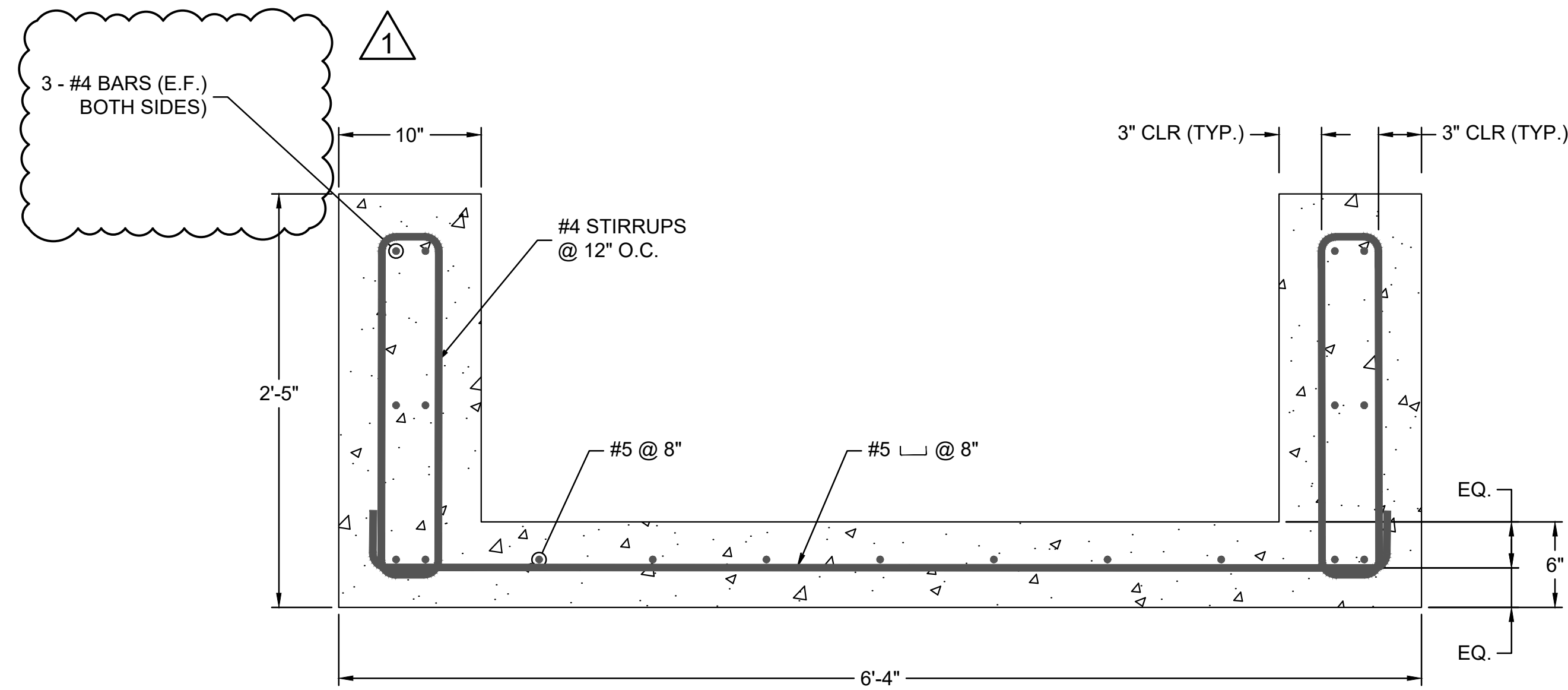
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE**

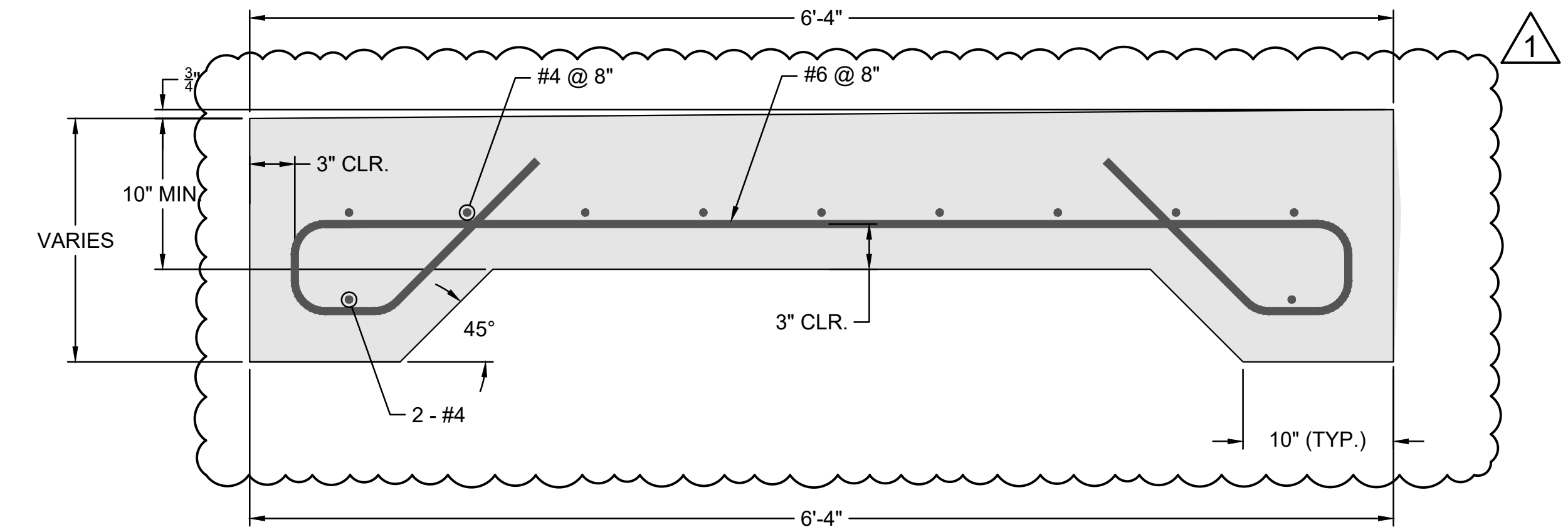
EDGE BEAM SECTIONS AND DETAILS - 2

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: BDW DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY: SCALE: REVISION NO.	DRAWING S-148 SHEET NO. 77 OF 142

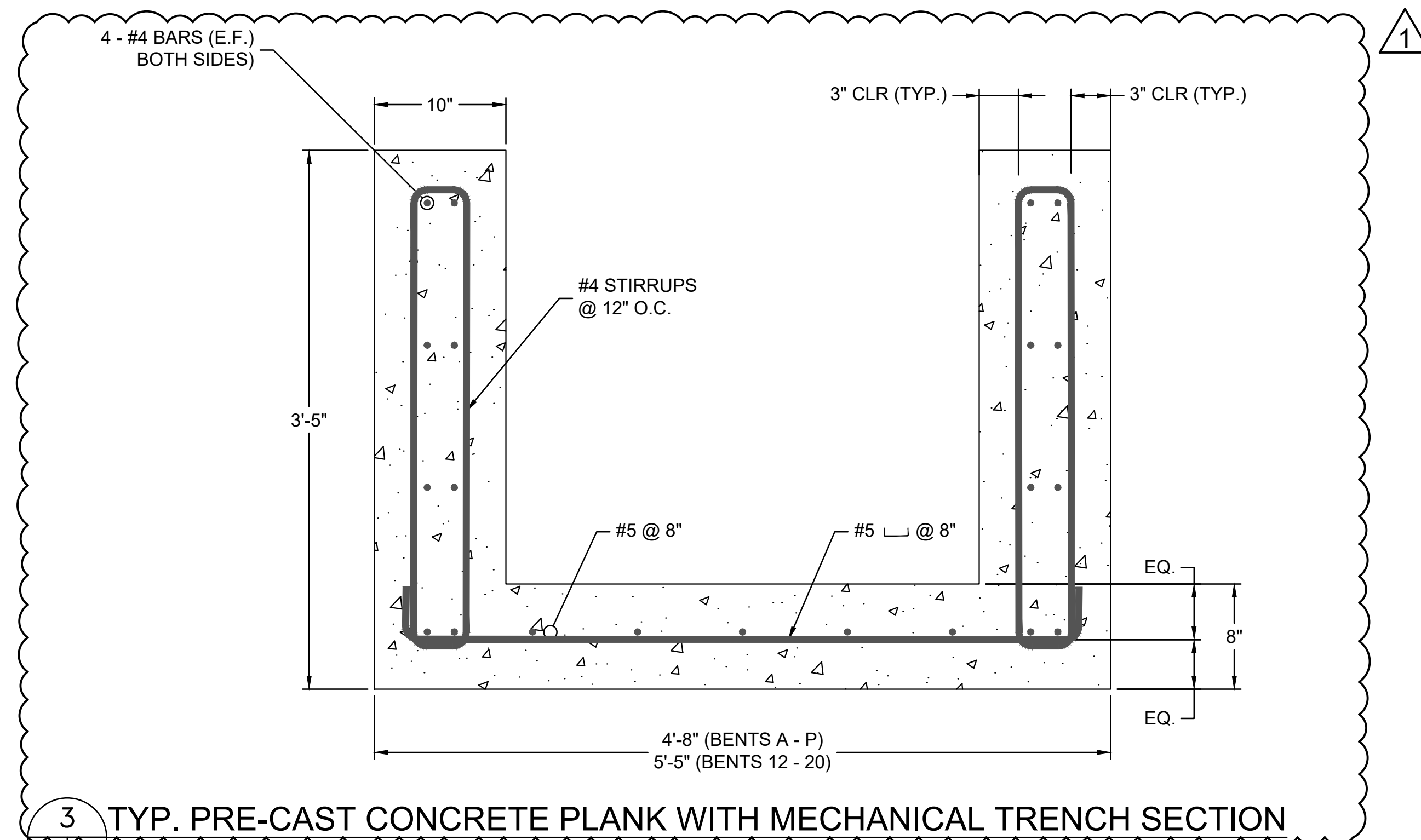
© 2024 - GZA GeoEnvironmental, Inc. WATERFRONT IMPROVEMENTS_ADD_2024-02-29.DWG S-148 DTLS S-148 (2) March 29, 2024 MICHAEL AUBIN



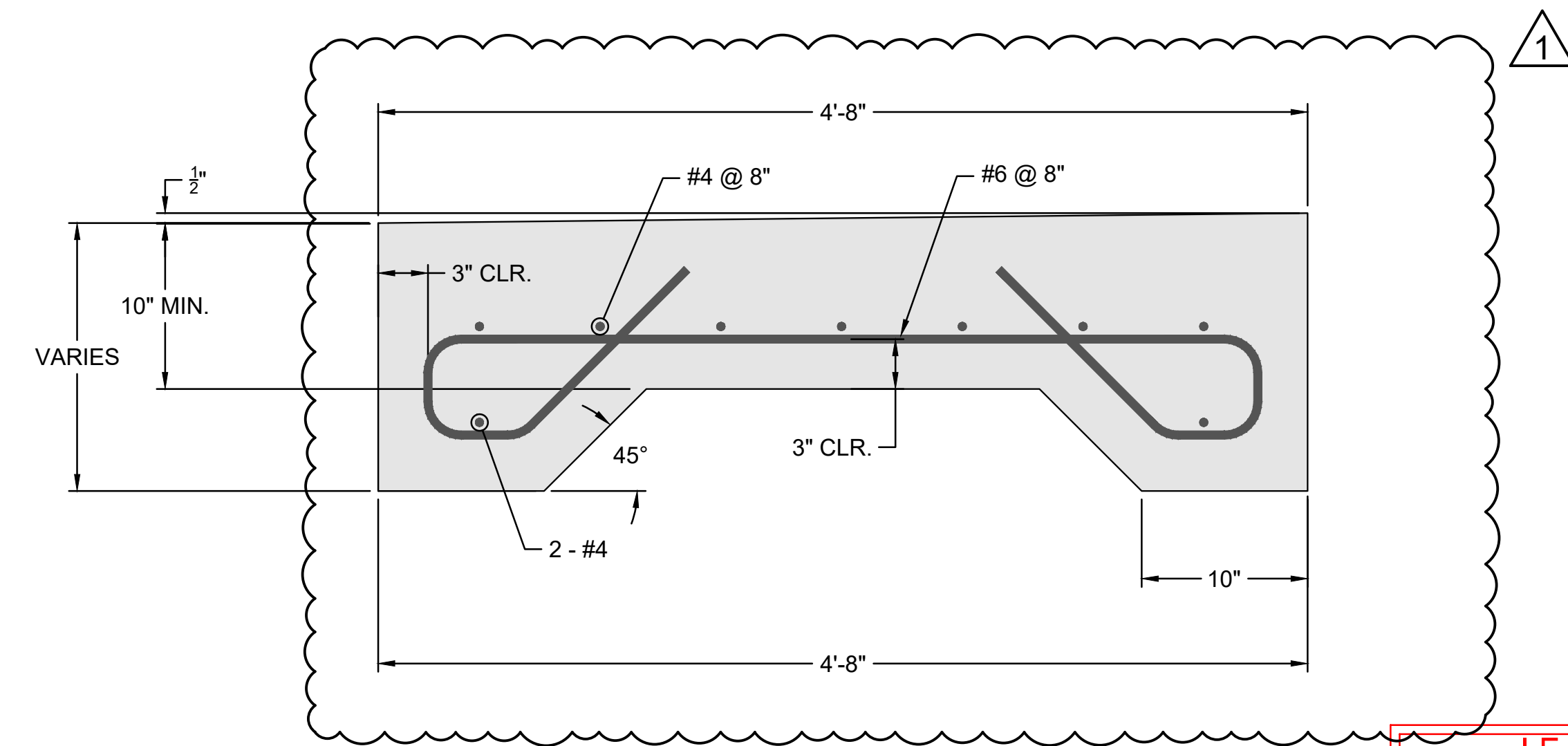
1 TYP. PRE-CAST CONCRETE PLANK WITH ELECTRICAL TRENCH SECTION
S-1205-153 1 1/2" = 1'-0"



2 TYP. PRE-CAST CONCRETE COVER FOR ELECTRICAL TRENCH SECTION
S-1205-153 1 1/2" = 1'-0"



3 TYP. PRE-CAST CONCRETE PLANK WITH MECHANICAL TRENCH SECTION
S-1215-153 1 1/2" = 1'-0"



4 TYP. PRE-CAST CONCRETE COVER FOR MECHANICAL TRENCH SECTION
S-1215-153 1 1/2" = 1'-0"

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

UTILITY TRENCH NOTES:

- ALL EXPOSED CONCRETE TO WEATHER SHALL HAVE A MINIMUM OF 3" CLEAR COVER AT ALL LOCATIONS. ALL CONCRETE NOT TO WEATHER SHALL HAVE A MINIMUM OF 1.5" CLEAR COVER AT ALL LOCATIONS.
- SEE UTILITY DRAWINGS FOR ADDITIONAL INFORMATION.
- GROUT FILL SIDES OF TRENCHES BETWEEN TRENCH AND PILE CAPS.

NO.	ISSUE/DESCRIPTION	DDF	DATE
2	ADDENDUM #7	DDF	3/29/2024
1	ADDENDUM #4	DDF	3/8/2024

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

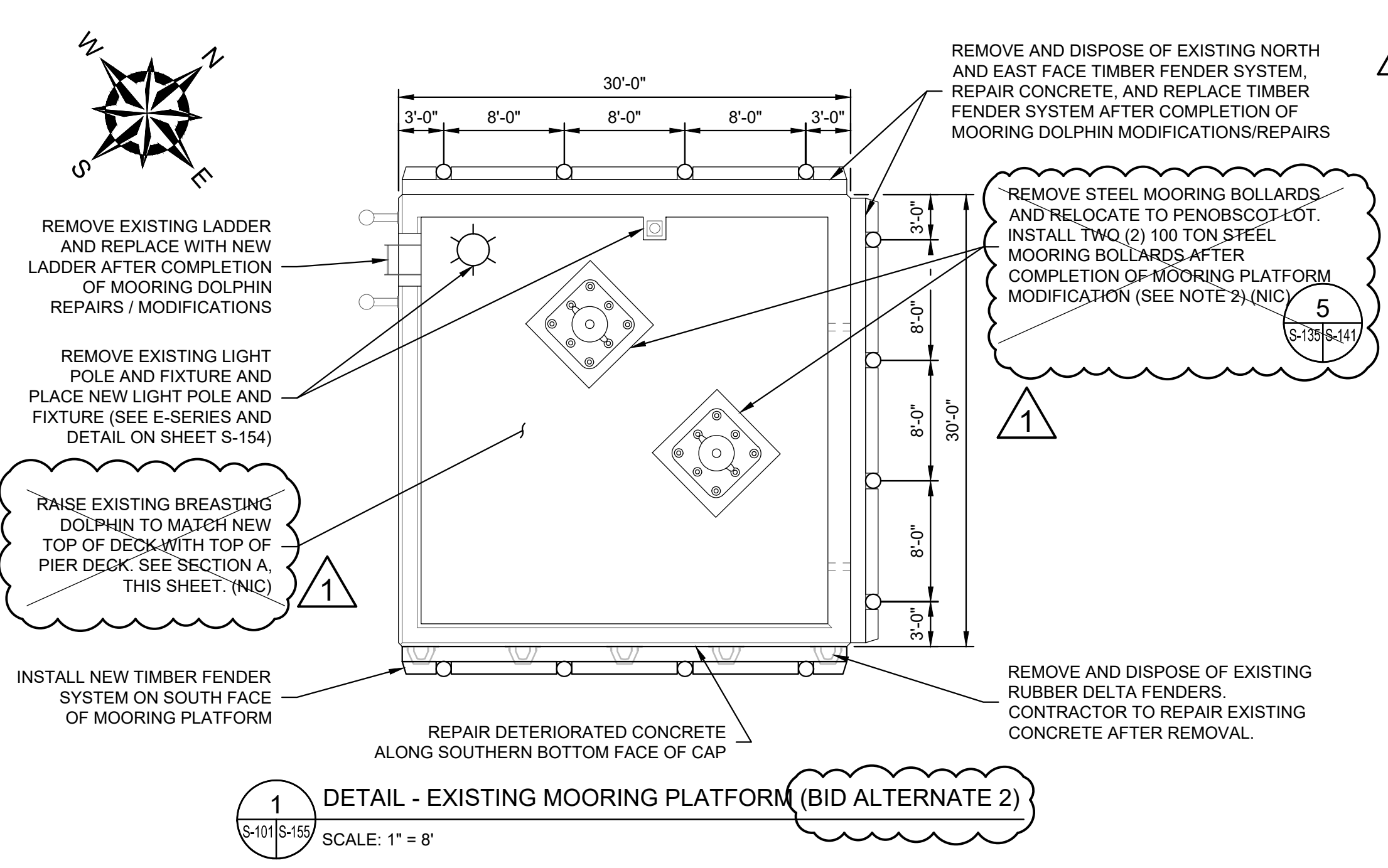
MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE

PRE-CAST UTILITY TRENCH DETAILS

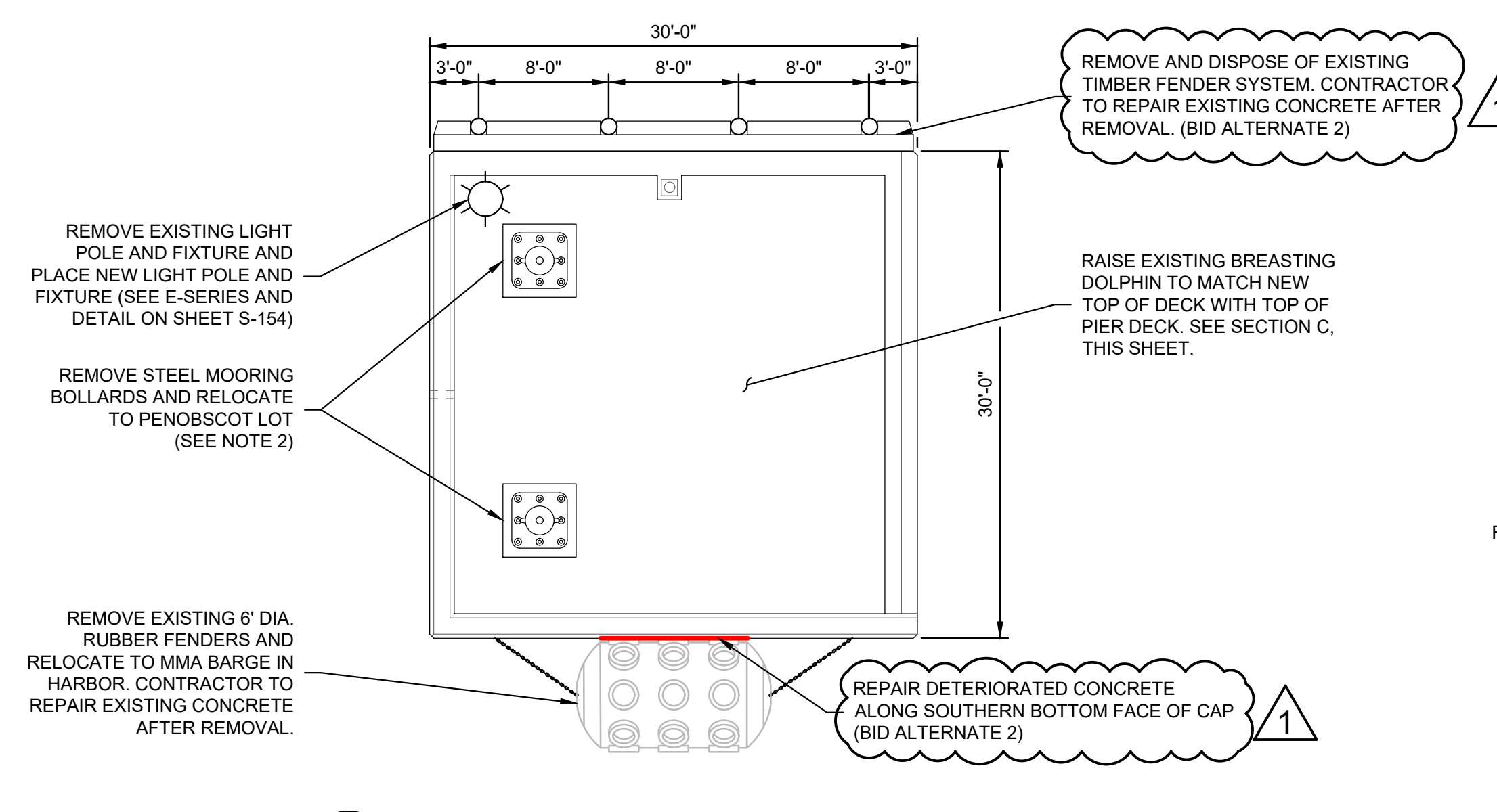
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MAR DATE: JANUARY 2024	REVIEWED BY: BDW DRAWN BY: BDW PROJECT NO. 03.0035109.00
CHECKED BY:	SCALE: REVISION NO.

S-154
SHEET NO. 83 OF 142

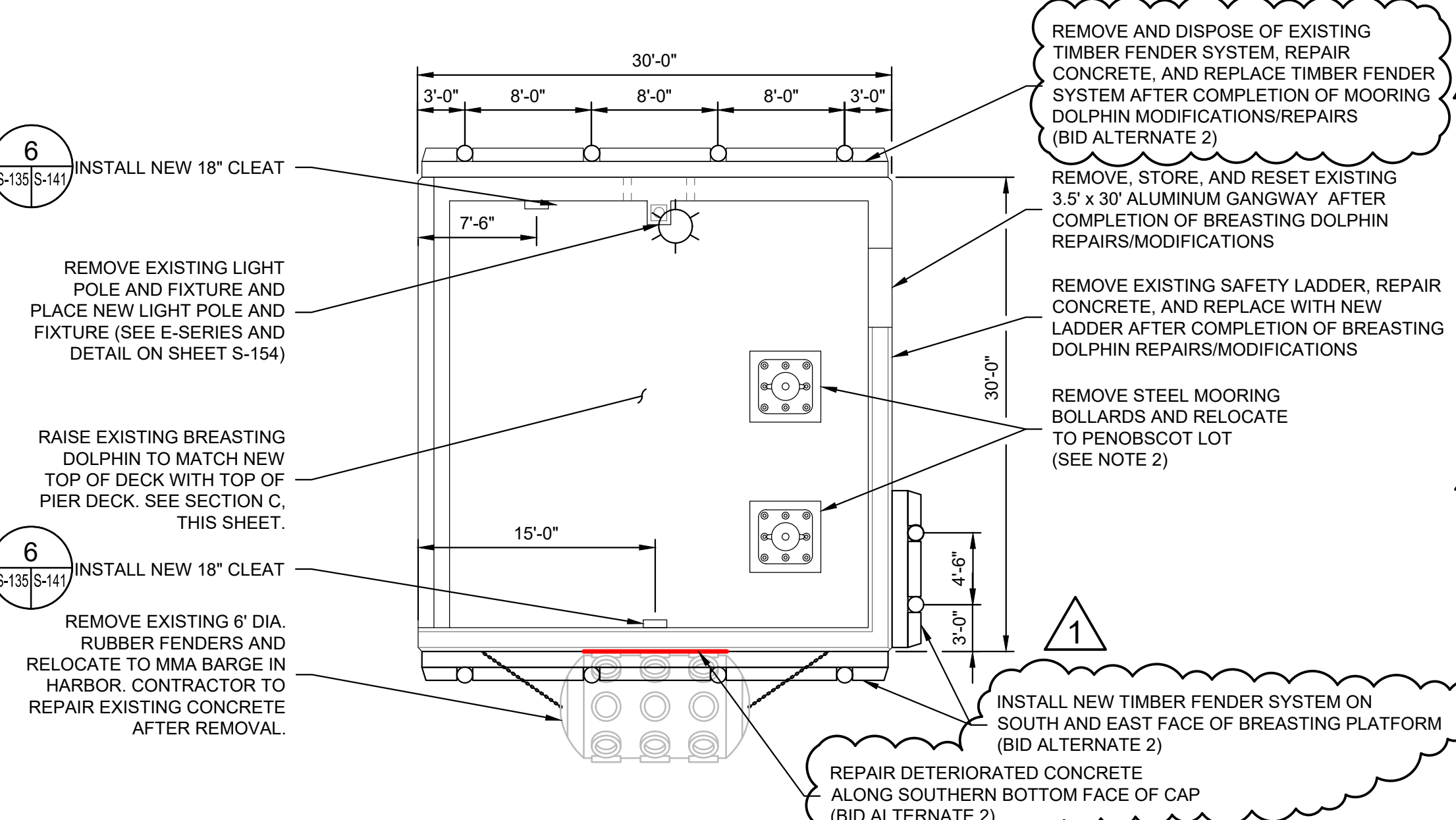
2024- GZA GeoEnvironmental, Inc. (GZA) 1000 PHN. SECT. 4.02-29 DWS. S-155. MOD. P.17M. RM. (1) January 31, 2024. VANESSA MALLOY
 2024- GZA GeoEnvironmental, Inc. (GZA) 1000 PHN. SECT. 4.02-29 DWS. S-155. MOD. P.17M. RM. (1) January 31, 2024. VANESSA MALLOY
 2024- GZA GeoEnvironmental, Inc. (GZA) 1000 PHN. SECT. 4.02-29 DWS. S-155. MOD. P.17M. RM. (1) January 31, 2024. VANESSA MALLOY



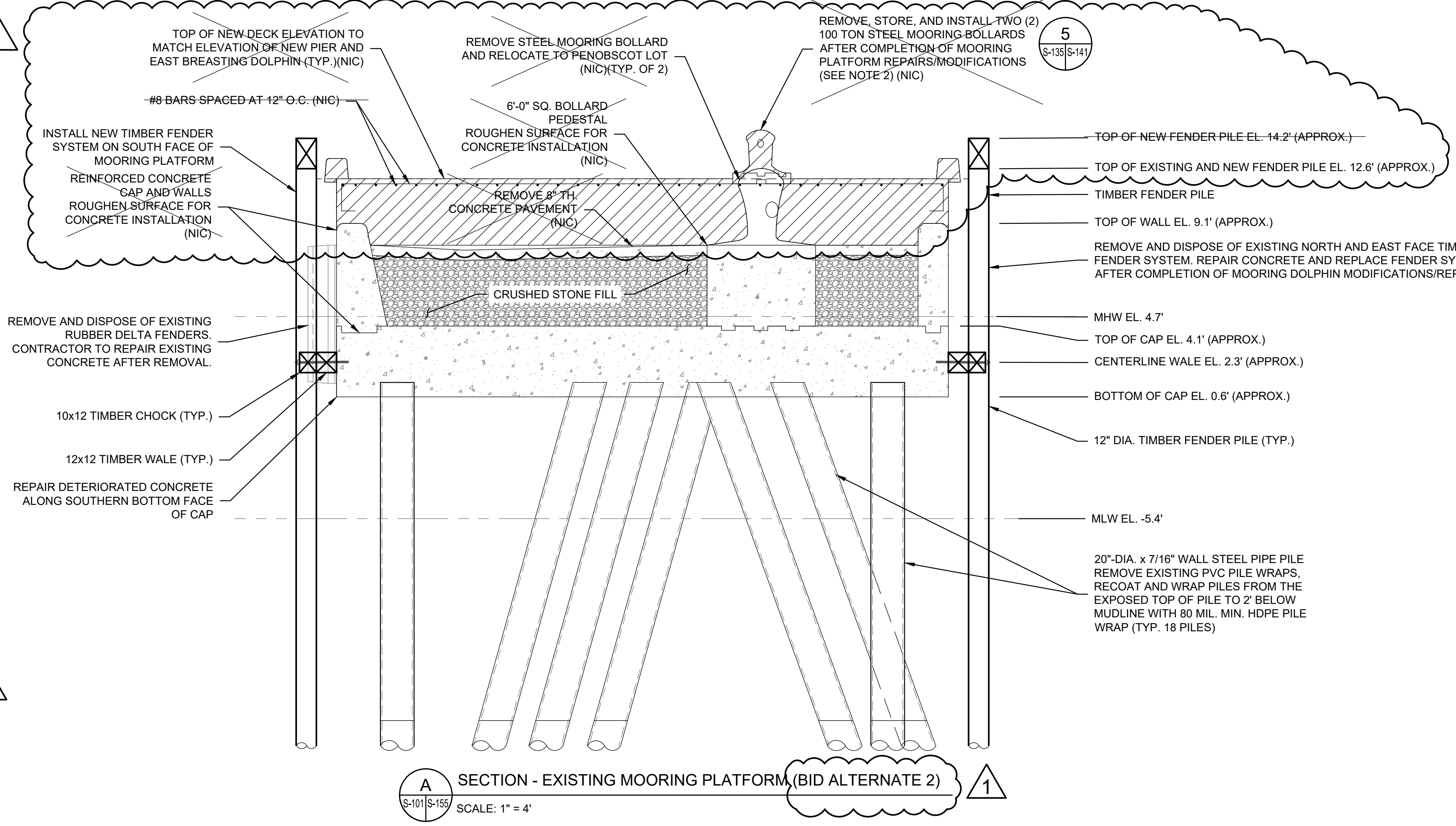
1 DETAIL - EXISTING MOORING PLATFORM (BID ALTERNATE 2)
 S-101/S-155 SCALE: 1" = 8'



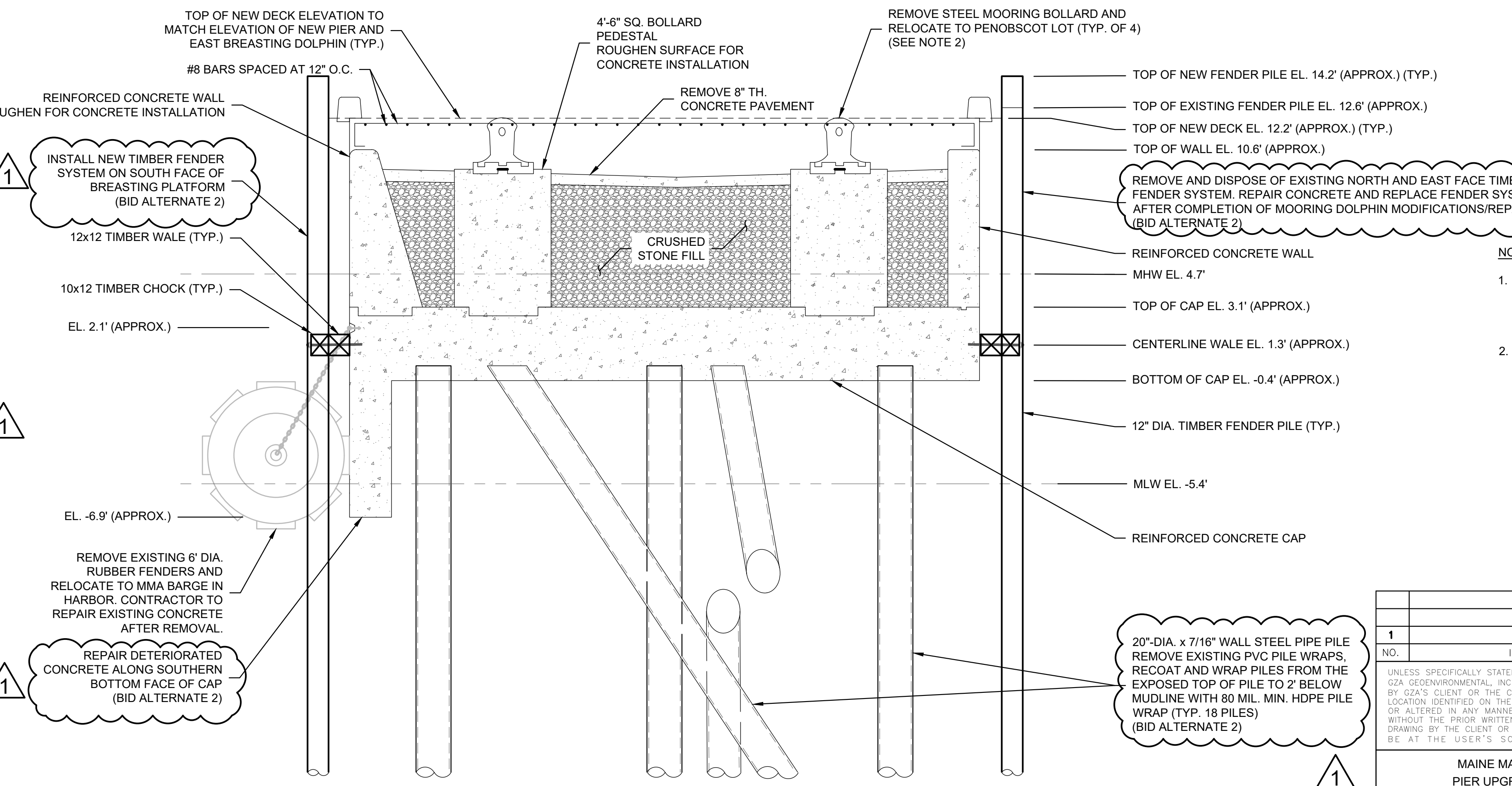
2 DETAIL - EXISTING BREASTING PLATFORM (WEST)
 S-101/S-155 SCALE: 1" = 8'



3 DETAIL - EXISTING BREASTING PLATFORM (EAST)
 S-101/S-155 SCALE: 1" = 8'



A SECTION - EXISTING MOORING PLATFORM (BID ALTERNATE 2)
 S-101/S-155 SCALE: 1" = 4'



C SECTION - EXISTING BREASTING PLATFORM (EAST)
 S-101/S-155 SCALE: 1" = 4'

- NOTES:**
- DETAILS ON THIS SHEET ARE A COMPILATION OF AVAILABLE ARCHIVE INFORMATION. ACTUAL CONDITIONS MAY VARY. REFER TO REFERENCE DRAWINGS FOR ADDITIONAL DETAILS.
 - CONTRACTOR SHALL INSPECT THE EXISTING MOORING BOLLARDS FOR RE-USE AFTER THE COMPLETION OF THE MOORING PLATFORM MODIFICATIONS.

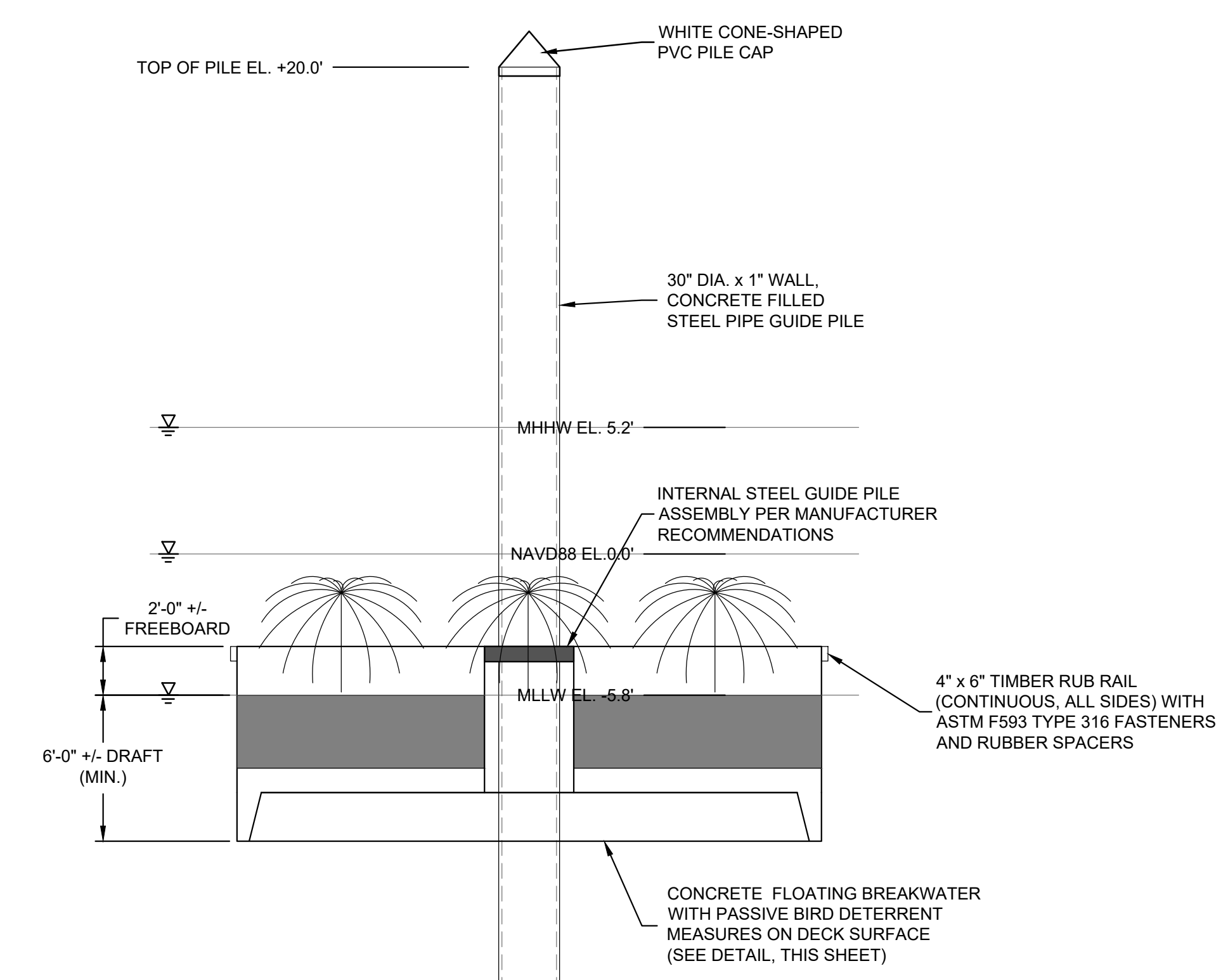
I.F.B.
 NOT FOR CONSTRUCTION
 JANUARY 26, 2024



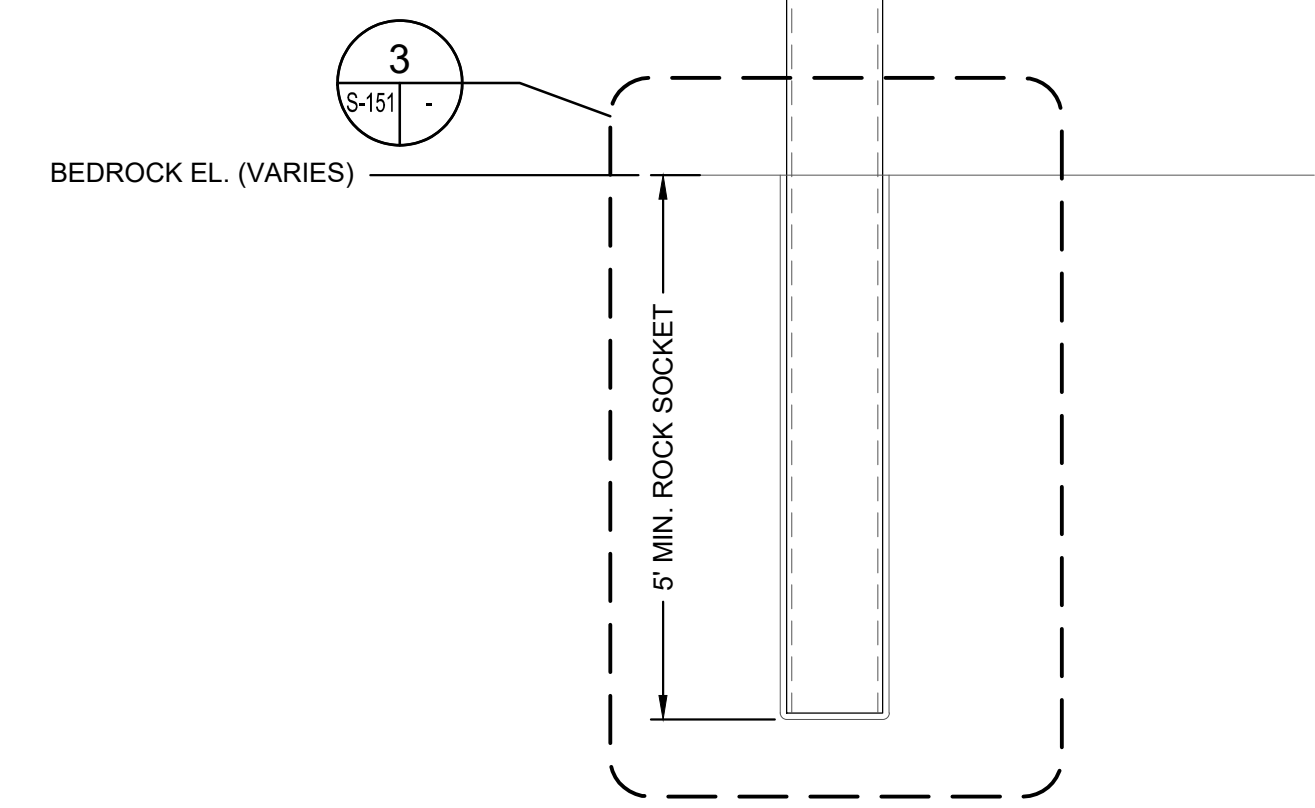
ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
1			

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE	
MOORING AND BREASTING PLATFORMS REPAIRS AND MODIFICATIONS	
PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: MEA DATE: JANUARY 2024	REVIEWED BY: CWC DRAWN BY: MEA PROJECT NO.: 35109.00 CHECKED BY: DDF SCALE: AS NOTED REVISION NO.:
DRAWING S-155 SHEET NO. 84 OF 142	

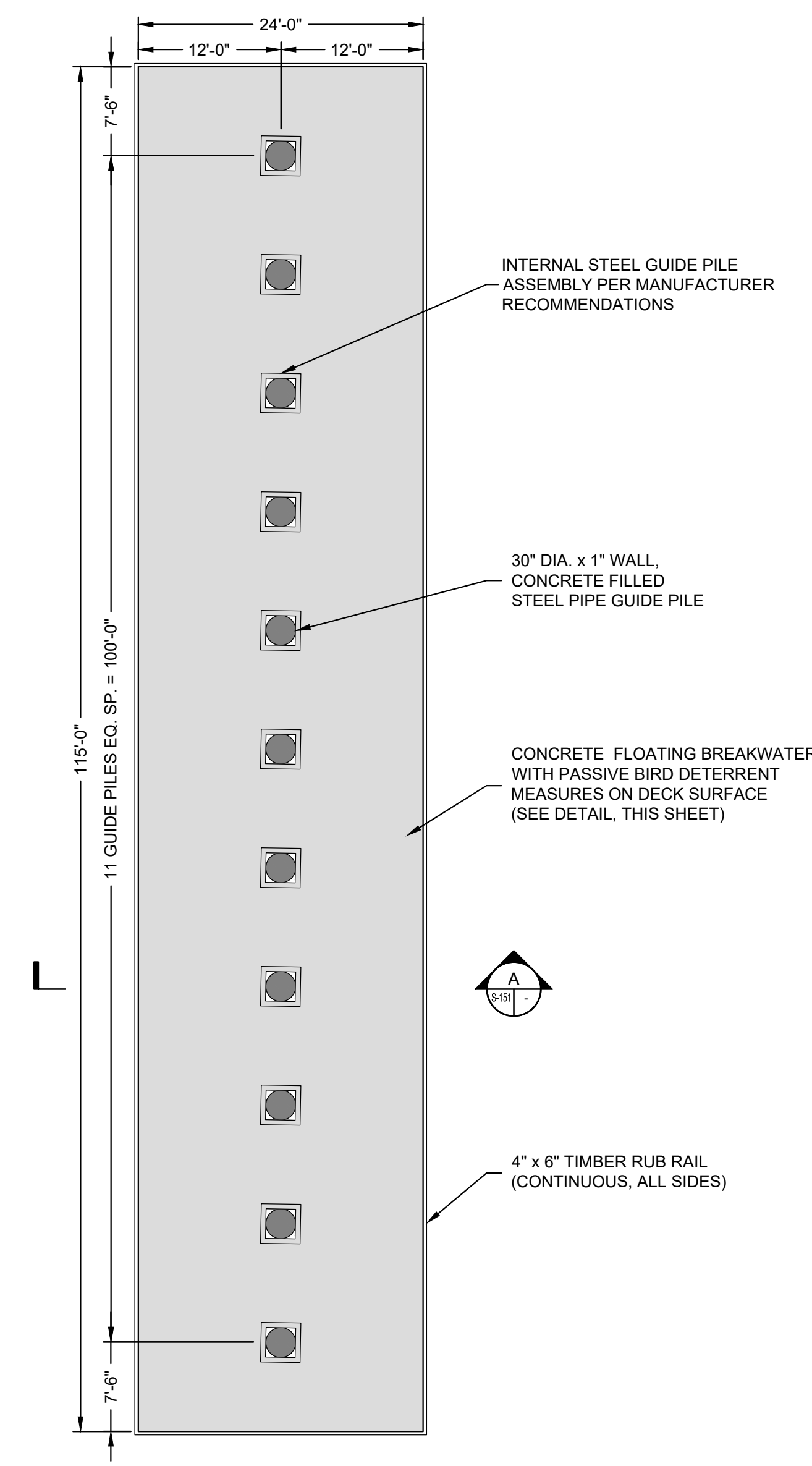


MUDLINE EL. (-28' TO -44')

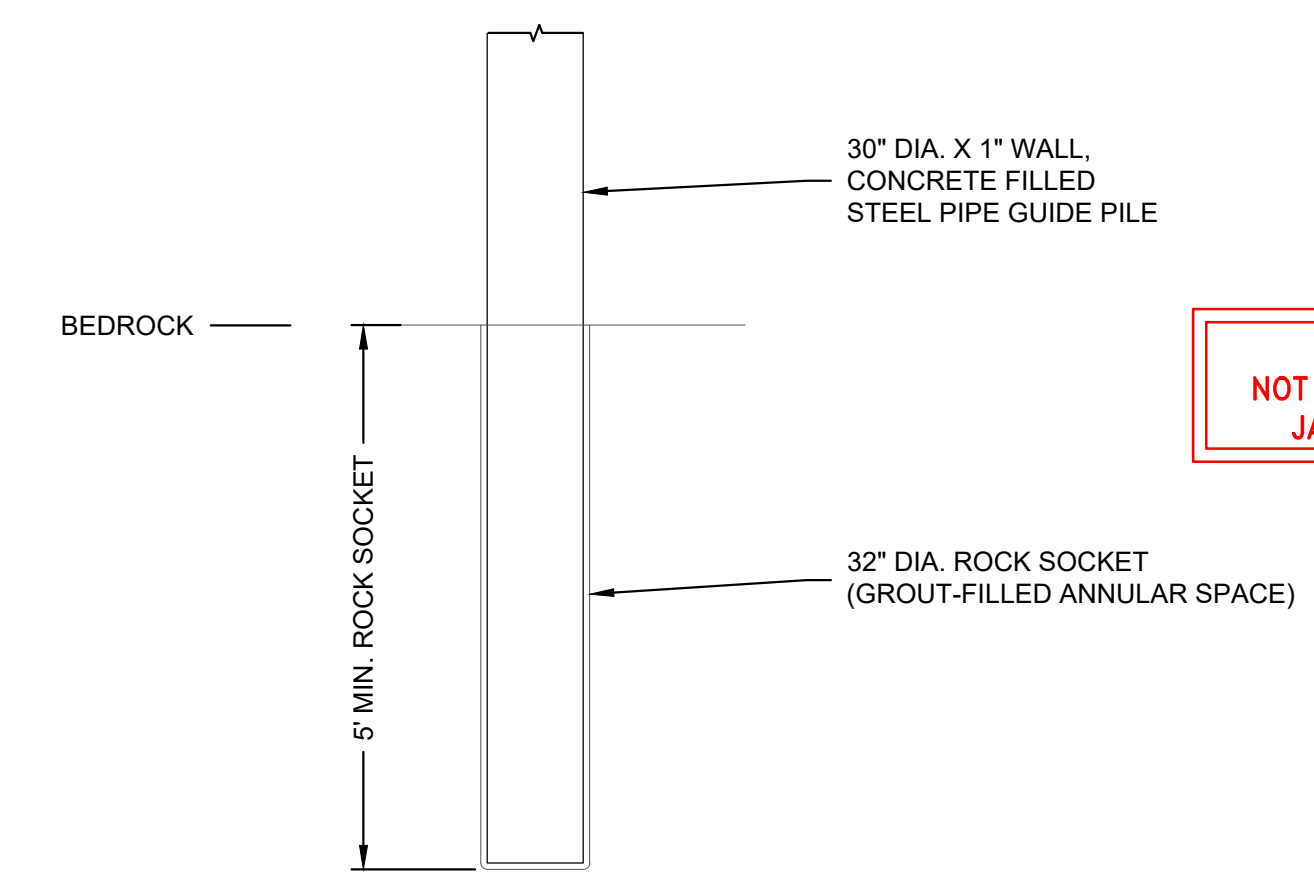


A SECTION - FLOATING BREAKWATER w/ GUIDE PILE
NOT TO SCALE

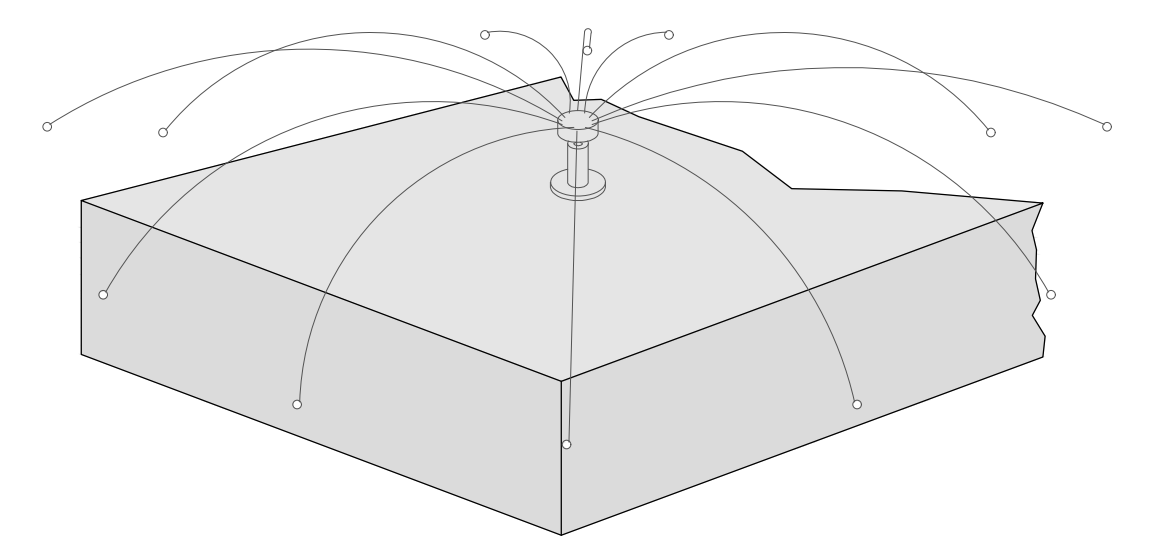
Floating Breakwater Pile Schedule					
PILE LOCATION	ESTIMATED BEDROCK ELEVATION (ft)	ROCK SOCKET LENGTH (ft)	ROCK ANCHOR LENGTH (ft)	ESTIMATED PILE LENGTH (ft)	BID LENGTH (ft)
1	-77.00	5	0	97.00	105
2	-76.00	5	0	96.00	105
3	-75.00	5	0	95.00	105
4	-73.00	5	0	93.00	100
5	-72.00	5	0	92.00	100
6	-71.00	5	0	91.00	100
7	-69.00	5	0	89.00	100
8	-68.00	5	0	88.00	95
9	-67.00	5	0	87.00	95
10	-65.00	5	0	85.00	95
11	-64.00	5	0	84.00	90



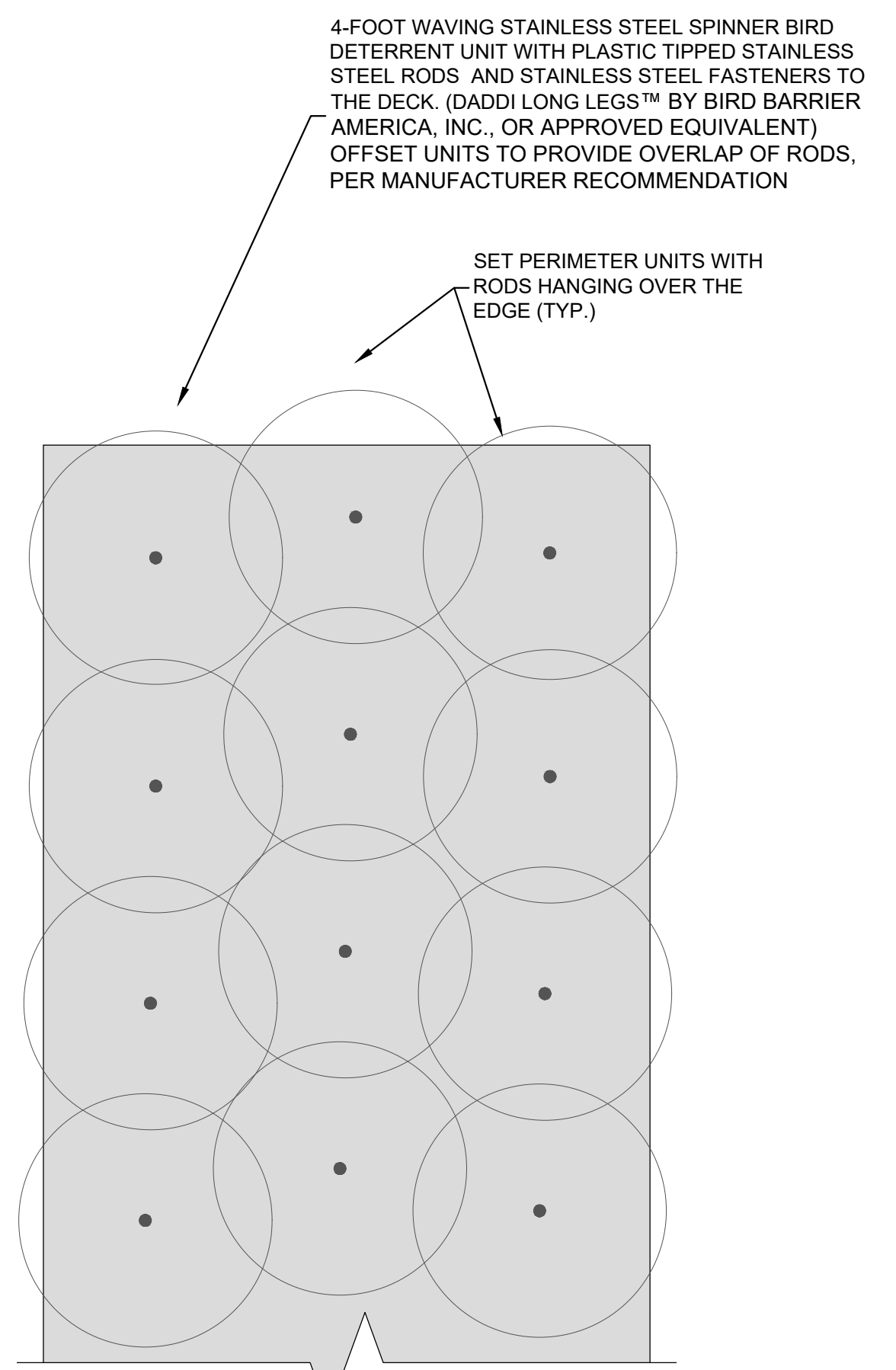
1 DETAIL - FLOATING BREAKWATER
SCALE: 1" = 10'



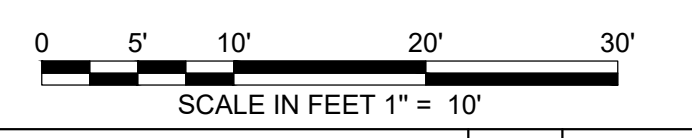
3 DETAIL - FLOATING DOCK GUIDE PILE ROCK SOCKET
NOT TO SCALE



DETAIL - BIRD DETERRENT



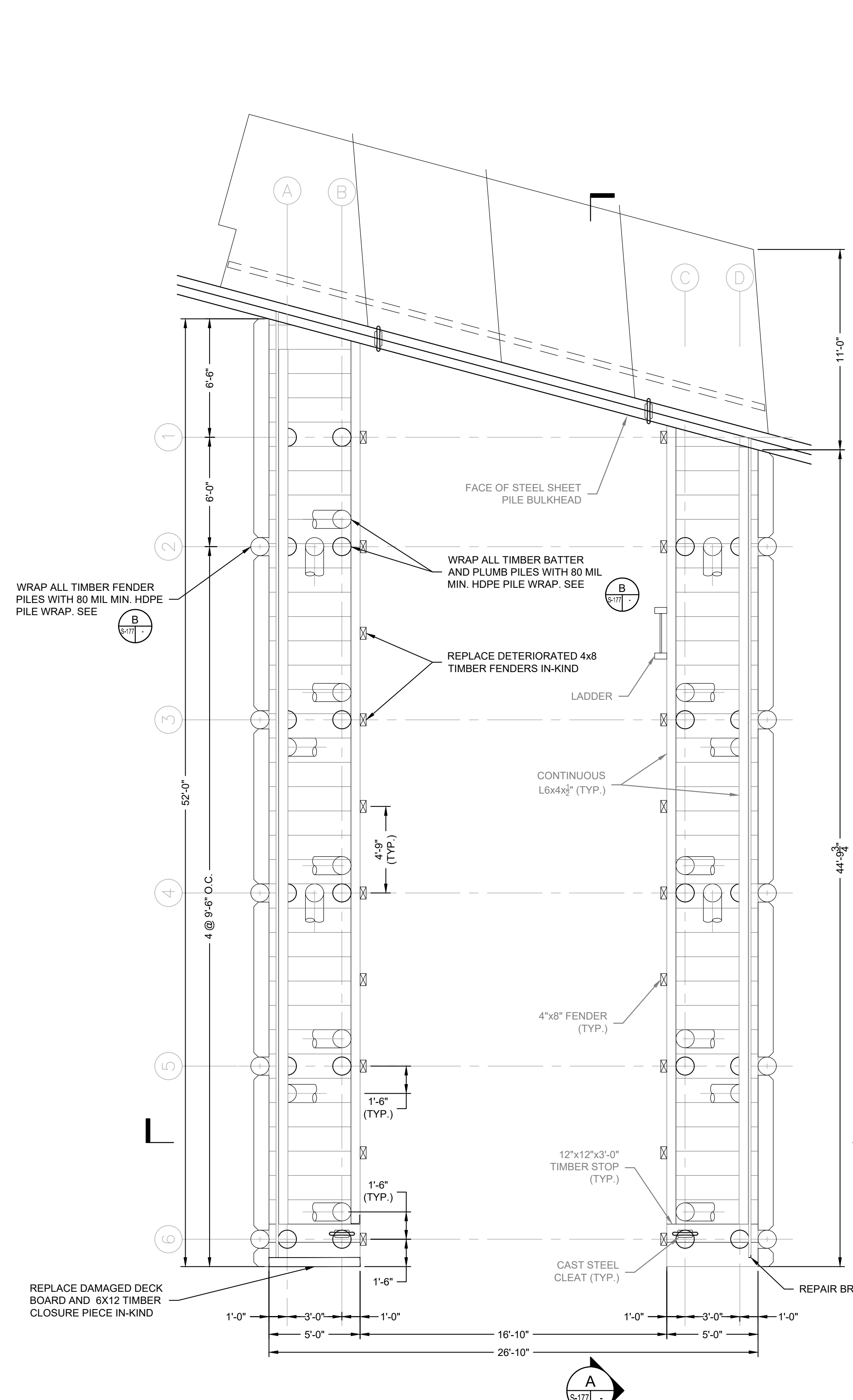
DETAIL - BIRD DETERRENT LAYOUT



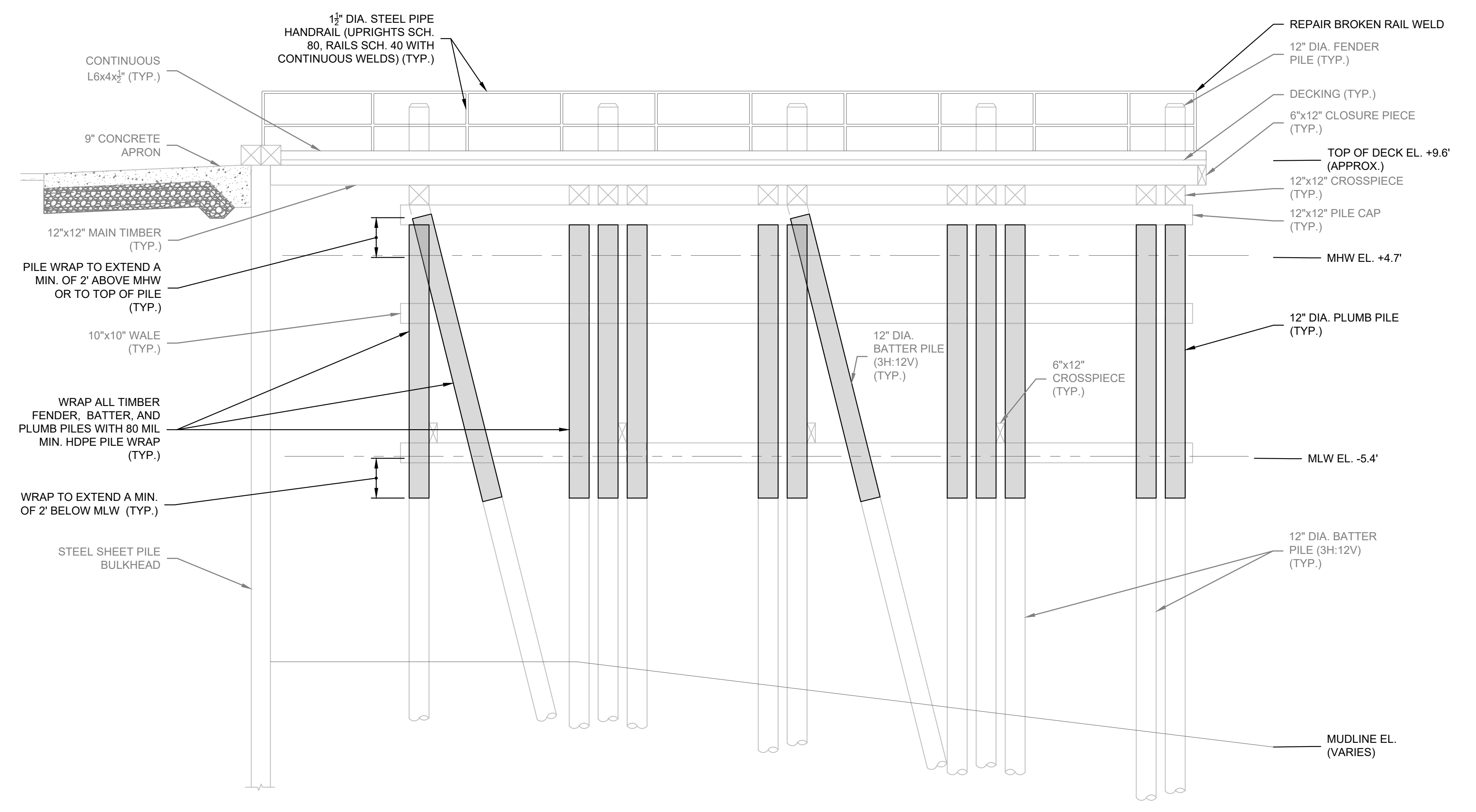
I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024

ADDENDUM #7		DDF	3/29/2024
NO.	ISSUE/DESCRIPTION	BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THIS DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THIS DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.			
MAINE MARITIME ACADEMY WATERFRONT CAMPUS PIER UPGRADES AND WATERFRONT IMPROVEMENTS CASTINE, MAINE			
FLOATING BREAKWATER PLAN, SECTIONS AND DETAILS BID ALTERNATE 5			
PREPARED BY:	GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC	DESIGNED BY: AFS	REVIEWED BY: CWC	CHECKED BY: DDF
DATE: JANUARY 2024	PROJECT NO. 35109.00	DRAWN BY: MEA	SCALE: AS NOTED
		REVISION NO.	
			FIGURE S-176
			SHEET NO. 105 OF 142

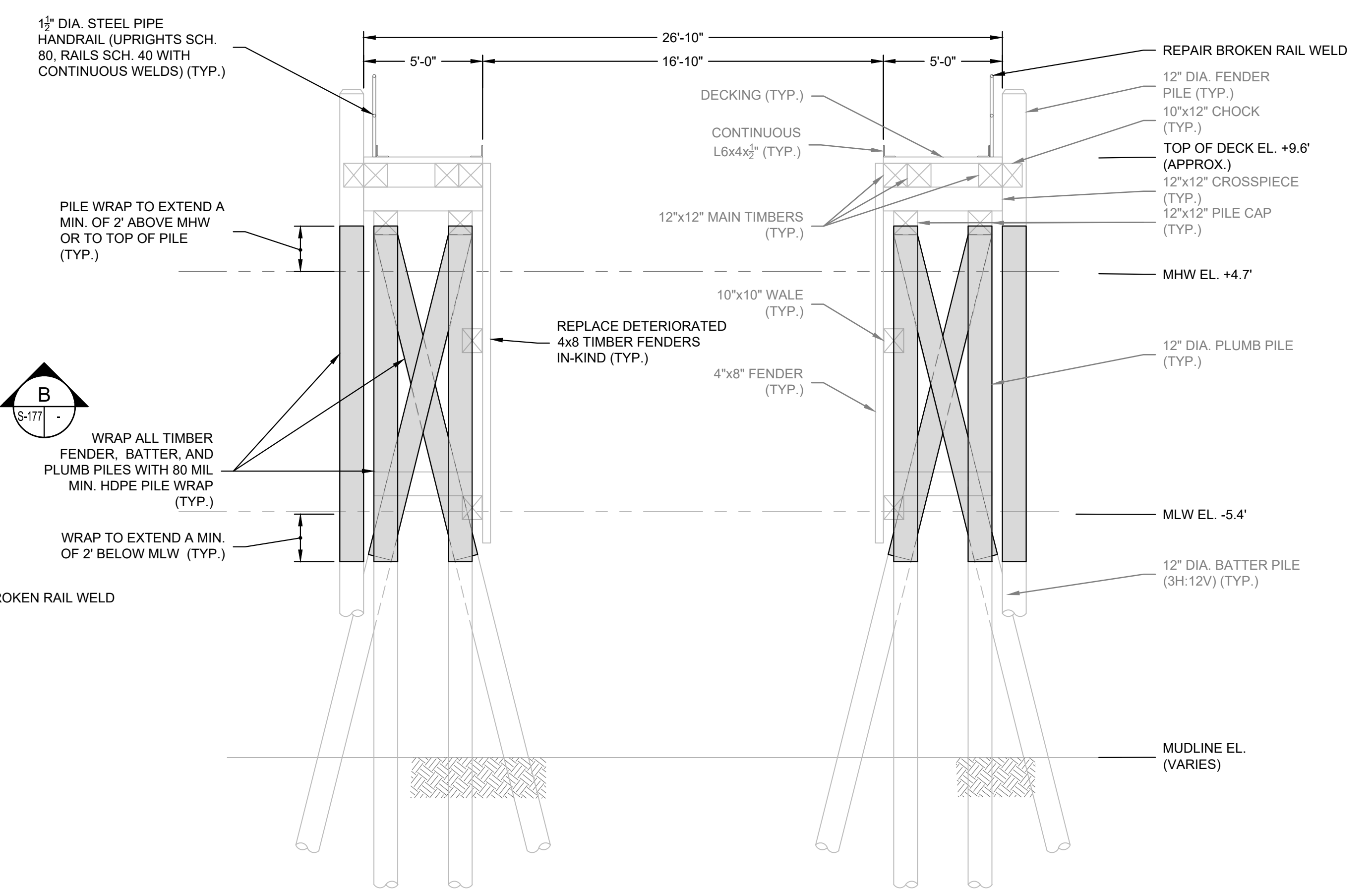
© 2024 GZA GeoEnvironmental, Inc. GZA is a U.S. Equal Opportunity Employer. BIRNIR_A00_2024-02-29.DWG S-176 FLOATING BREAKWATER February 5, 2024 MINNESOTA MALLOY



1 DETAIL - PLAN - TRAVEL LIFT
SCALE: 1" = 4"



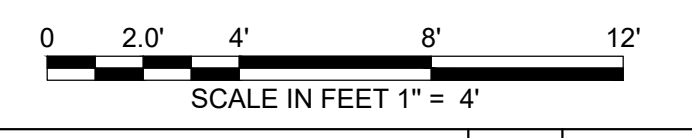
A SECTION - TRAVEL LIFT
SCALE: 1" = 4"



B SECTION - TRAVEL LIFT
SCALE: 1" = 4"

- NOTES:**
1. DETAILS ON THIS SHEET ARE A COMPILATION OF AVAILABLE ARCHIVE INFORMATION. ACTUAL CONDITIONS MAY VARY, REFER TO REFERENCE DRAWINGS FOR ADDITIONAL DETAILS.
 2. PILE WRAPS TO BE INSTALLED IN ACCORDANCE WITH CONTRACT DOCUMENTS AND PER MANUFACTURER RECOMMENDATIONS.

I.F.B.
NOT FOR CONSTRUCTION
JANUARY 26, 2024



NO.	ISSUE/DESCRIPTION	DDF	DATE
1	ADDENDUM #7		3/29/2024

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOTECHNICAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

**MAINE MARITIME ACADEMY WATERFRONT CAMPUS
PIER UPGRADES AND WATERFRONT IMPROVEMENTS
CASTINE, MAINE**

**TRAVEL LIFT PLAN AND SECTIONS
BID ALTERNATE 3**

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PREPARED FOR: MAINE MARITIME ACADEMY CASTINE, ME
PROJ MGR: RKC DESIGNED BY: AFS DATE: JANUARY 2024	REVIEWED BY: CWC DRAWN BY: MEA PROJECT NO.: 35109.00
CHECKED BY: DDF SCALE: AS NOTED REVISION NO.:	DRAWING S-177 SHEET NO. 106 OF 142

© 2024 - GZA GeoEnvironmental, Inc. GZA is a registered professional engineering firm in the State of Maine. License No. 10150. GZA is a registered professional engineering firm in the State of Maine. License No. 10150. GZA is a registered professional engineering firm in the State of Maine. License No. 10150.

**00 41 13
Contractor Bid Form**

Maine Maritime Academy Pier and Waterfront Improvements Project
BGS project number 3396

Bid Form submitted by: *email only to email address below*

Bid Administrator:

Robert Gurney
Bureau of General Services
111 Sewall Street, Cross State Office Building, 4th floor
77 State House Station
Augusta, Maine 04333-0077

BGS.Architect@Maine.gov

Bidder:

Signature: _____

Printed name and title: _____

Company name: _____

Mailing address: _____

City, state, zip code: _____

Phone number: _____

Email address: _____

State of incorporation, if a corporation: _____

List of all partners, if a partnership: _____

The Bidder agrees, if the Owner offers to award the contract, to provide any and all bonds and certificates of insurance, as well as Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers if required by the Owner, and to sign the designated Construction Contract within twelve calendar days after the date of notification of such acceptance, except if the twelfth day falls on a State of Maine government holiday or other closure day, or a Saturday, or a Sunday, in which case the aforementioned documents must be received before 12:00 noon on the first available business day following the holiday, other closure day, Saturday, or Sunday.

As a guarantee thereof, the Bidder submits, together with this bid, a bid bond or other acceptable instrument as and if required by the Bid Documents.

**00 41 13
Contractor Bid Form**

1. The Bidder, having carefully examined the Maine Maritime Academy Pier and Waterfront Improvements Project Project Manual dated January 26, 2024, prepared by GZA GeoEnvironmental, Inc., as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project for the **Base Bid** amount of:

\$ _____ .00

2. Allowances *are included* on this project.
Bid amount above includes the following Allowances

 *Prefabricated Brow Allowance* \$ 250,000.00

3. Alternate Bids *are included* on this project.
Alternate Bids are as shown below
Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **\$0.00**.

1 *Maintenance Dredging* \$ _____ .00

 2 *Existing Mooring and Breasting Platforms Repairs* \$ _____ .00

 3 *Existing Structures Replacement, Improvements & Repairs* \$ _____ .00

 4 *West Floating Dock System* \$ _____ .00

 5 *Floating Breakwater System* \$ _____ .00

4. Bid security *is required* on this project.
If noted above as required, or if the Base Bid amount exceeds \$125,000.00, the Bidder shall include with this bid form a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with this completed bid form submitted to the Owner.

5. Filed Sub-bids *are not required* on this project.
If noted above as required, the Bidder shall include with this bid form a list of each Filed Sub-bidder selected by the Bidder on the form provided (section 00 41 13F).

SECTION 02 22 13.01

MOVEMENT AND VIBRATION MONITORING – CONTRACTOR RESPONSIBILITIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 00 and DIVISION 01 which are hereby made a part of this Section of the Specifications. Examine all other Sections of the Specifications for requirements which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- B. Coordinate Work with that of all other trades or contracts affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under the Contract.

1.2 DESCRIPTION OF WORK

- A. The Owner's Engineer will provide all labor, equipment, and materials necessary to monitor and report vibrations and movement of critical structures and features during Work.
- B. The Owner's Engineer will provide all Structure Monitoring Points (SMPs), crack gauges, and tilt beams and survey of SMPs, crack gauges, and tilt beams.
- C. Contractor shall perform all Work in such a manner to not exceed the ground vibrations and movement limits described in this Section.
- D. Contractor shall conduct Work without damaging or altering vibration and movement monitoring equipment, and other monitoring equipment that is existing or is installed by the Owner's Engineer.
- E. Contractor shall employ appropriate vibration and movement mitigation measures and address and resolve any complaints, damage and exceedances of threshold and limit value criteria as described herein.
- F. Repairs of damage resulting from the Work exceeding the movement, deformation, and vibration limits presented herein shall be restored to pre-construction conditions by Contractor and to the satisfaction of the Engineer. Repairs of damage to existing structures and utilities resulting from the Work exceeding the limits shall be performed at the expense of the Contractor, at no cost the Owner. Contractor will not be entitled to extension of schedule or additional costs resulting from any such work stoppage.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. If the Contractor elects to install their own movement and vibration monitoring equipment, the Contractor shall submit, in writing to Construction Manager and Engineer, the proposed instrumentation and monitoring plan. Instrumentation shall meet the requirements specified herein. If necessary, Contractor shall engage a third party registered professional engineer to perform the supplemental monitoring. The submittal information shall include instrumentation type, frequency of data collection, calibration sheets, reporting methods, qualifications, and a plan showing location of additional instrumentation. Information shall be submitted at least 21 days prior to start of Work.

2. Vibration Monitoring Work Plan: Submit a work plan for vibration mitigation related work, not less than 14 days prior to starting Work. At a minimum, this Vibration Monitoring Work Plan shall include the following:
 - a. A description of vibration-producing activities, including description, location, and anticipated dates and times of activities.
 - b. A listing of structures, utilities and other vibration-sensitive receptors that may be impacted by vibrations. At a minimum, the listing shall include:
 - 1) Existing bulkhead structures
 - 2) On-Site buildings
 - 3) Underground utilities in the area that are sensitive to movement and vibrations.
 - 4) On-Site structural features that be susceptible to movement and vibrations.
 - c. Mitigation measures that shall be implemented to limit construction vibrations, and measures that shall be implemented in the event that construction vibrations exceed the values included in this Section, including but not limited to, the measures described in this Section.
 - d. A plan to address and resolve vibration complaints
- B. When necessary, as Work proceeds, Contractor shall submit, in writing, all requests for proposed changes in the Owner's Engineer's SMP and Tilt Beam locations, and the Contractor's monitoring equipment if used, to accommodate field conditions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Owner's Engineer will provide all equipment and materials as outlined below. SMP, Crack Gauge, and Tilt Beam components as necessary.

2.2 STRUCTURE MONITORING POINTS (SMPs)

- A. All SMPs shall consist of one of the following:
 1. Automated Motorized Total Station (AMTS) optical survey targets. Optical survey targets will include:
 - a. A 3D survey target consisting of either an L-bar Mini Prism or a right-angle reflector target.
 - b. An AMTS used to measure longitudinal, transverse, and vertical movements of the survey targets mounted on buildings and structures such as the Leica TM-50, TOPCON MS AX or other equipment, as approved equal.
 - c. The AMTS will include software and hardware capable of making automatic measurements at regular intervals. The software will allow for data to be queried on demand by Engineer and Contractor.
- B. CRACK GAUGES
 1. Crack Gauges will be calibrated direct read building Crack Gauges consisting of overlapping glass/acrylic plates or electronic vibrating wire displacement gauges. Crack gauges will be installed at selected locations on existing structures where cracks or separations were noted during the pre-construction surveys performed by Contractor. Crack gauges shall consist of the following:

- a. The Crack Gauges consisting of overlapping glass/acrylic plates (interior) will be capable of being read to a resolution of 0.02 inch with a maximum horizontal range of at least 0.75 inch and a vertical range of at least 0.375 inch.
- b. Electronic vibrating wire displacement gauges such as Geokon Model 4420 or acceptable equivalent will be installed at exterior locations. The electronic vibrating wire displacement gauges will be affixed to the exterior of existing structures and connected to dataloggers to establish logging and remote access.

C. TILT BEAMS

1. Tilt Beams will consist of triaxial Micro-Electro-Mechanical Systems (MEMS) tilt sensors. The tilt beams will include software and hardware capable of making remote, continuous, automatic measurements. The software will allow for data to be queried on demand by Engineer and Contractor.
2. Tilt Beams such as Geokon Model 6195 or approved equivalent will be installed at exterior locations. The Tilt Beams will be affixed to the exterior of existing structures and connected to dataloggers to establish logging and remote access.

D. SEISMOGRAPHS

1. Automated seismographs such as Micromate III, manufactured by Instanel Inc., or equivalent. Seismographs will be capable of reading seismic events in either a manual, single shot, or continuous mode of operation. Recorded vibration data will consist of peak particle velocity and frequency for longitudinal, transverse, and vertical directions.
2. Seismographs will consist of the following features for vibration monitoring using a standard triaxial geophone:
 - a. Range: 0.01 to 10 in/s with an accuracy of +/-5% of the measured peak particle velocity at frequencies between 4 and 125 Hz, and with resolution of 0.01 in/s or less.
 - b. Frequency range: 2 to 250 Hz.
 - c. Acoustic range: 88 to 144dB with an accuracy and resolution of +/-1dB.
3. The Owner's Engineer will provide all required accessories and data analysis and presentation software, including external geophones, microphones, and enclosures.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Owner's Engineer will furnish, install and monitor the SMPs, Crack Gauges, Tilt Beams, and Seismographs of their vibration and monitoring program. Contractor shall provide support, as necessary, to the Owner's Engineer during installation of the instrumentation, including manlifts and labor for installation of optical systems and AMTS along buildings and structures.
- B. The Owner's Engineer will maintain a secure web-based platform to display real-time data collected from their Automated Total Station (ATS) system(s). The web-based platform will include plan views of instrument locations; time rate plots of displacement and vibration levels at the instrumentation; visual alarm icons identifying instrumentation locations exceeding project threshold and limiting values; on-demand data downloading; automated daily reporting; and e-mail alert notifications if thresholds are exceeded. The Contractor will be granted secure access to the website and will be included in the e-mail alert notifications.
- C. Contractor shall conduct Work without damaging or altering SMPs, Crack Gauges, Tilt Beams, and Seismographs. Contractor shall notify Engineer of damaged instrumentation equipment as a

consequence of construction activities at the Site. Contractor shall repair or replace damaged or inoperative instruments, as determined by the Owner's Engineer, at Contractor's expense.

- D. Contractor shall take the necessary steps to minimize vibration and movement such that they are below the identified threshold and limiting values identified herein.
- E. Contractor shall monitor the data on the Owner's Engineer's provided web-based platform and email notifications. If any limits described herein are exceeded, Contractor shall immediately implement appropriate engineered controls such that acceptable levels are achieved and/or Work shall be stopped at no additional cost to Owner. The Owner's Engineer has authority to stop work at any time if these limits are exceeded or if cracking, deformation, settlement, or other damage is observed.

3.2 RESPONSE VALUES AND INTERPRETATION OF DATA

A. General:

- 1. Threshold and limiting values are defined collectively as Response Values. Response Values are subject to adjustment by Engineer as indicated by prevailing conditions or circumstances.
- 2. Response Values are referenced to baseline readings. Response Values may be modified by Engineer to include background motion observed during monitoring prior to construction. Additional baseline readings may be collected during periods of no Work activities.

B. Movement and Deformation Limits

- 1. The vertical or horizontal movement Response Values for the SMPs and Tilt Beams are as follows:

INSTRUMENT	THRESHOLD VALUE	LIMITING VALUE
SMPs on buildings existing bulkhead	0.375-Inch vertical or horizontal displacement	0.5-Inch vertical or horizontal displacement
Tilt Beams on buildings	0.05° angular distortion	0.08° angular distortion

- 2. Vertical deformation includes settlement or heave.

C. Crack Gauge Limits

- 1. The Response Values for the Crack Gauges are as follows:

INSTRUMENT	THRESHOLD VALUE	LIMITING VALUE
Crack Gauges	Change in crack width of 0.06 inches (1.5 mm)	Change in crack width of 0.1 inches (2.5 mm)

D. Vibration Limits

- 1. The Response Values for the Seismographs are as follows:

INSTRUMENT	THRESHOLD VALUE	LIMITING VALUE
Seismographs – Continuous or Steady State Vibration	Peak Particle Velocity of 0.25 in/sec	Peak Particle Velocity of 0.4 in/sec
Seismographs – Transient or Impact Vibration	Peak Particle Velocity of 0.3 in/sec	Peak Particle Velocity of 0.5 in/sec

2. Response Values for continuous or steady state vibrations apply to vibrations induced by vibratory hammers, drill rigs, jack hammers, reciprocating pavement breakers, compactors, large pumps and compressors, bulldozers, trucks, cranes, and other large machinery.
3. Response Values for transient or impact vibrations apply to vibrations such as blasting, drop chisels, clam shell buckets, impact pile drivers, wrecking balls, building demolition, gravity drop compactors, and gravity drop pavement breakers.

E. If a Threshold Value is reached:

1. Contractor shall immediately notify the Owner's Engineer.
2. Contractor shall meet with the Owner's Engineer to discuss Contractor response action(s). Response actions may include:
 - a. Increase instrument monitoring frequencies (performed by the Owner's Engineer).
 - b. Install and monitor additional instruments (performed by the Owner's Engineer with support of the Contractor as necessary for installation per Paragraph 3.1.A).
 - c. Modification of construction procedures. Contractor shall submit a plan of action to the Owner's Engineer so that the Limiting Values are not exceeded.

F. If a Limiting Value is reached or exceeded:

1. All Work by Contractor in the vicinity of the exceedance shall stop until a meeting takes place between Contractor, the Owner's Engineer, and Owner to assess the cause of the exceedance.
2. A submittal shall be prepared and submitted to the Owner's Engineer and Owner by Contractor indicating what activity caused the exceedance and what steps Contractor shall undertake to prevent further exceedances of the limits. No work in the vicinity of the exceedance shall be restarted until the submittal is reviewed and approved by the Owner's Engineer and Owner.

G. Contractor shall implement all steps necessary so that the Limiting Value is not exceeded and damage to adjacent structures and utilities is not incurred.

3.3 PROTECTION OF INSTRUMENTS

- A. Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations.
- B. If an instrument is damaged as a result of the Contractor's operations, Contractor shall repair or replace the damaged instrument and the cost shall be borne by the Contractor. The Owner's Engineer may impose a work stoppage in the vicinity of the damaged instrument until it is again operational. Contractor will not be entitled to extension of schedule or additional costs resulting from any such work stoppage.

3.4 COMPLAINT RESOLUTION

- A. If movement or vibrations complaints are received, Contractor shall modify work activities to minimize construction vibrations at no additional cost to Owner.
- B. Contractor shall not be compensated for any schedule delays caused by complaints or exceedances of movement, deformation, and vibration limits presented herein.

END OF SECTION

SECTION 23 07 19

INSULATION FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe, and equipment insulation.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for each type of mechanical insulation identifying k-value, thickness, density, flexural strength, compressive strength, linear shrinkage, flame spread, smoke developed rating, property compliance, manufactures color charts & samples (if applicable) and furnished accessories for each system requiring insulation.

C. Material certificates, signed by the manufacturer, certifying that materials comply with specified requirements where laboratory test reports cannot be obtained.

D. Material test reports prepared by a qualified independent testing laboratory. Certify insulation meets specified requirements.

1.4 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

B. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

C. Exterior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

D. Field-Constructed Mock-Up: Install representative sample of each insulation type and finish to demonstrate workmanship quality. Include method of attachment and finishing for each. Designer and Owner to approve prior to remainder of installation.

1.5 SCHEDULING

A. Schedule insulation application after testing of piping systems.

B. Schedule insulation application after installation and testing of heat trace, where applicable.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver insulation, coverings, cements, adhesives, and coating to the site in containers with manufacturer's stamp or label affixed showing fire hazard indexes of products.

B. Storage and Handling: Protect insulation against dirt, water, chemical, and mechanical damage. Do not install damaged or wet insulation; remove from project site. The Contractor shall provide a storage area for weather protection of all insulation materials and accessory materials after their arrival at the job site. Outside storage of insulating materials is prohibited.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturer	Mineral Wool	High Performance Blanket	Removable Jacket
1. IIG (Industrial Insulation Group)	X		
2. Roxul	X		
3. Delta	X		
4. SPI (Specialty Products & Insulation Co.)	X		
5. Aspen Aerogels		X	
6. Cabot Aerogel		X	
7. Insultech			X
8. Thermaxx			X
9. Armacell		X	X

2.2 APPLICATIONS - PROVIDE PIPE AND EQUIPMENT INSULATION AS SPECIFIED BELOW:

A. Interior Piping – includes piping inside the boiler plant and adjacent room in Andrews Hall.

Piping System or Service	Pipe Sizes	Thickness	Group	Finish	Structural Insert	Notes
High Pressure Steam (HPS)	1-1/4" and smaller	3"	MW	AL		High Temp.
	1-1/2" and larger	4.5"	MW	AL		High Temp.
Condensate Return (CR)	3" and smaller	2.5"	MW	AL		High Temp.
High Pressure Condensate (HPC)	2" and smaller	3"	MW	AL		High Temp.
Domestic Water, Non-Potable	2" and smaller	1"	MW	PVC		Low Temp.

Piping System or Service	Pipe Sizes	Thickness	Group	Finish	Structural Insert	Notes
Water (DCW, NPW)						

2.3 NOTES:

A. General: Insulation and finish for equipment and pipe drains shall match system type.

B. Distribution Piping – Includes piping in the vault, pier trench, and above grade.

Piping System or Service	Pipe Sizes	Thickness	Group	Finish	Structural Insert	Notes
High Pressure Steam (HPS)	Less than 1"	1"	HPB	SS	High Temp.	
	1" to 1-1/4"	1.4"	HPB	SS	High Temp.	
	1-1/2" and larger	2"	HPB	SS	High Temp.	
Condensate Return (CR)	3" and smaller	1.6"	HPB	SS	High Temp.	
High Pressure Condensate (HPC)	Less than 1"	1"	HPB	SS	High Temp.	
Sump Pump Discharge (SPD)	All Sizes	0.8"	HPB	SS	High Temp.	
Domestic Cold Water (DCW)	All Sizes	2"	MW	SS	Fiberglass pipe shield.	
Sanitary (SAN)	All Sizes	2"	MW	SS	Fiberglass pipe shield.	

C. Equipment and Accessories Insulation

Piping System or Service	Thickness	Group	Finish	Notes
High Pressure Steam Shutoff Service Valves	Min 0.2"	RJ	--	
Control Valves (for All Services)	Min 0.2"	RJ	--	
Strainers >2" (for All Services)	Min 0.2"	RJ	--	
Steam Trap Stations	Min 0.2"	RJ	--	1
Expansion Joints	Min 0.2"	RJ	--	

Piping System or Service	Thickness	Group	Finish	Notes
Flow Meters	Min 0.2"	RJ	--	

NOTES:

1. Provide two removable jackets to insulate the steam trap station assembly. The first jacket is from the upstream isolation valve to the union before the steam trap. The second jacket is from the downstream union to the last isolation valve of the steam trap station. All steam trap station valves and drains including isolation, strainer blow off, trap test shall remain operable with removable jackets in place.

2.4 GROUP MW – MINERAL WOOL PIPE INSULATION

A. Insulation shall be pre-formed mineral wool pipe insulation providing high water repellent characteristics. Mineral wool pipe insulation shall comply with the property requirements of ASTM C 547 – Standard Specification for Mineral Fiber Preformed Pipe Insulation. Insulation shall be provided with factory applied all service jacketing (ASJ) with self-sealing lap (SSL). The jacketing shall be factory applied double pressure-sensitive adhesive system with provides positive closure and vapor sealing of the longitudinal joint, at ambient temperatures ranging from 25°F to 110°F. Joints between insulation sections shall be sealed with butt strips which have a two component adhesive system. Insulation shall be manufactured from basalt rock and slag bonded together with a high temperature binder.

B. Insulation shall meet the following performance requirements:

Thermal Conductivity	0.23 Btu-in/hr-ft ² -°F @ 75 °F
	0.29 Btu-in/hr-ft ² -°F @ 200 °F
Flame Spread	25 or less
Smoke Production	50 or less
Average Density	7 lb/ft ³
Max Temperature	1,200 (°F)
Moisture Absorption	< 1%

C. Design Basis: Rock Wool Delta-PF

2.5 GROUP HPB – HIGH PERFORMANCE BLANKET INSULATION

A. Insulation shall be a high-temperature, flexible, hydrophobic insulation blanket. Insulation shall be provided in blanket form for wrapping of straight pipe sections. Prefabricated insulation sections shall be provided for piping elbows. Insulation shall be available in 0.20 inch and 0.40-inch thickness.

B. Insulation shall meet the following performance requirements:

1. Thermal Conductivity: Insulation shall at minimum meet the following thermal conductivity performance. Some products (aerogel) have superior performance than what's listed below, and therefore require less insulation thickness. Refer to charts in Paragraph 2.2 for thickness requirements.

- a. 0.162 Btu-in/hr-ft²-°F @ 100 °F
- b. 0.183 Btu-in/hr-ft²-°F @ 200 °F
- c. 0.203 Btu-in/hr-ft²-°F @ 300 °F
- 2. Flame Spread: 0
- 3. Smoke Production: 0
- 4. Max Temperature: 1,200 °F

C. Acceptable Manufacturers:

- 1. Aspen Aerogels Pyrogel XTE (Basis of Design)
- 2. Cabot Aerogels
- 3. Armacell Armagel

2.6 GROUP RJ – REMOVABLE INSULATION JACKET/BLANKET

A. General: Provide a custom, removable insulation jacket for each product as indicated in the application table above. Insulation jackets shall be factory-fabricated by a manufacturer specializing in the product. Products shall not be field- or installer-fabricated. Modularized, cut-to-suit, insulation blanket kits are not acceptable.

B. Insulation: Insulation shall be Pyrogel XTE high-temperature, non-woven, flexible, hydrophobic insulation blanket formed of silica aerogel and reinforced with a non-woven, glass-fiber batting by Aspen Aerogel. Insulation shall comply with ASTM C1086 - Standard Specification for Glass Fiber Mechanically Bonded Felt Thermal Insulation. Insulation shall meet the following performance requirements:

Thermal Conductivity	0.16 Btu-in/hr-ft ² -°F @ 212 °F
Max Temperature	450 °F
Maximum Water Vapor Transmission	0.00 perm
Maximum Moisture Absorption	0.2% by volume

- 1. All insulation materials shall be Non-Asbestos
- 2. Insulation thickness shall be of sufficient thickness to maintain outer jacket surface temperature below 120 °F, but not less than 0.2 inches. Manufacturer shall submit calculations showing proof of outer surface temperature.

C. Jacket:

- 1. Silicone impregnated fiberglass cloth, 17 oz/sq. yd. minimum. Materials shall be by one of the following manufacturers:
- 2. Alpha Maritex Style 3259-2-SS, by Alpha Assoc. Inc.
- 3. Lewco 1750S, by Lewco Industries, Inc.

D. Construction:

- 1. Double sewn lock stitch with a minimum 4 to 6 stitches per inch. Jackets shall be sewn with two (2) parallel rows of stitching using pure Kevlar thread. The thread must be able to withstand the skin temperatures without degradation. Hog rings or stapled edges are not acceptable methods of seam closure.
- 2. No raw cut jacket edges shall be exposed.

3. All stitching will be done with three-ply braided pure Teflon or Kevlar thread.
4. Jackets shall be fastened using 1 to 1 ½ inch wide belts fabricated from the outer jacket material, tri-folded and straight stitched. Belts shall utilize D-ring fasteners or slide release buckles sewn onto the belt to complete the closure. D-rings or slide release buckles shall be 304 or 316 stainless steel. 1 to- 1 ½ inch wide Hook & loop tabs shall be sewn onto the belt and mating outer jacket. Belting will be sewn onto the outer jacket fabric with a minimum of 4 inch stitched to the outer jacket. At the interface between the jackets and surrounding insulation, a flap with Teflon or Steel draw cord shall be provided. Closure Cord when required shall be Kevlar.
5. To accommodate leaks and detect their origins, provide a stainless steel or brass grommet at the low point of each jacket for leak detection and moisture drain.
6. Provide a permanently attached stainless steel nameplate on each jacket to identify its location, size and tag number.
7. The insulation shall be designed to minimize the convection current in the space between the hot metal surface and the inner layer of insulation. To this end, during jacket fabrication, the layers of insulating mat shall be placed in an overlapping pattern.
8. All jacket pieces which match mating seams must include an extended 2 inch flap constructed from the exterior fabric and shall be secured using hook & loop closure (i.e. Velcro ®) parallel to the seam.
9. Jacket design will encase the piece of equipment or valve including the valve bonnet. A minimum overlap flap beyond the mating rigid insulation will be a minimum of 3 inch. If overlapping is not possible, pipe covering insulation will butt up to the adjoining surface.
10. Insulation must be sewn as integral part of the jacket to prevent shifting of the insulation.
11. The color of the outer face jacket shall be gray for all piping and equipment or as requested by the Owner.

E. Approved Manufacturers: Thermaxx, InsulTech, Advance Thermal Corp., or approved equal.

2.7 INSULATING CEMENTS

A. Mineral Fiber: ASTM C 195.

1. Thermal Conductivity: 1.0 Btu x inch/h x sq. ft. x deg F average maximum at 500°F mean temperature.
2. Compressive Strength: 10 psi at 5 percent deformation.

B. Expanded or Exfoliated Vermiculite: ASTM C 196.

1. Thermal Conductivity: 1.10 Btu x inch/h x sq. ft. x deg F average maximum at 500°F mean temperature.
2. Compressive Strength: 5 psi at 5 percent deformation.

C. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400°F mean temperature.
2. Compressive Strength: 100 psi at 5 percent deformation.

2.8 ADHESIVES

A. Lagging Adhesive: Water based; MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

3. Mold Resistant - Coatings shall meet ASTM D 5590 with 0 growth rating.
4. Design Basis: Foster 30-36 AF or Childers CP-137 AF.

2.9 INSULATING FINISHES / JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. TYPE PVC - PVC JACKETING: High-impact, ultra-violet (UV) resistant PVC, color coded, roll stock ready for shop or field cutting and forming to indicated sizes. Fitting covers shall be pre-formed. Product shall meet the following requirements:

1. PVC Jacketing shall meet the following requirements:
 - a. Thickness: 30 mils
 - b. Temp Range (°F): -35°F to 140°F
 - c. Specific Gravity: 1.46
 - d. Water Sorption: 0.05
 - e. Tensile Strength: 7,000 psi (ASTM D638)
 - f. Flexural Strength: 11,000 psi (ASTM D 790)
 - g. Flame Spread Rating (ASTM E84): 25
 - h. Smoke Develop Rating (ASTM E84): 50
 - i. Izod Impact: 15.0 ft.lb/in.
 - j. Thermal Conductivity (ASTM C177): 0.26 @ 70°F
2. Adhesive: Solvent vinyl weld adhesive as recommended by insulation manufacturer.
3. Color: Pre-colored per Section 230553 "Identification for Piping and Equipment". Do not paint PVC Jacketing and Fittings.

C. TYPE AL – ALUMINUM JACKET ~~AND PITTWRAP:~~

- ~~1. Provide PITTWRAP heat sealable, multiply laminate jacketing system suitable for 190°F. PITTWRAP shall be a minimum of 3 mm thickness.~~
2. Provide directly over the insulation an aluminum weatherproof jacket. This jacket shall be manufactured from aluminum alloy **5005** or **3003** half hard, not less than **0.020** inch thick. Material shall meet standard ASTM B-290. The jacket shall have a stucco embossed finish. The jacketing shall have a 3 mil polysurlyn moisture barrier (an engineered three-layer coextruded film of polyethylene and Surlyn polymers) factory heat laminated to the interior surface. Polykraft moisture barrier is not acceptable. Jacketing shall conform to standard ASTM C1729, "Standard Specification for Aluminum Jacketing for Insulation".
3. The jacketing shall be secured by aluminum alloy 5005 or 3003 straps, 1/2-inch-wide by 0.020 inch thick. The straps shall be placed on 12-inch centers (maximum). Each circumferential joint shall have a strap at the midpoint of the lap. Banding shall be secured by aluminum or stainless steel banding seals.
4. All elbows and tees shall be protected with a prefabricated elbow jacket. The jacket shall be manufactured of high purity 0.024-inch aluminum with a polysurlyn moisture barrier on the interior of the jacket to prevent decomposition of the jacketing. On diameters where prefabricated jackets are not available the roll jacketing shall be in sections cut on the miter, overlapped, and forming a neat snug fit, using sufficient bands and fasteners to hold jacket properly in place.
5. All joints shall be made rain or drip proof. Longitudinal joints shall be located on the side of the pipe with the open edge of the lap turned down to shed water. Circumferential joints on pipes that do not have enough slope to get a good shingle effect to keep water out of the joint shall have the

inside end of the lap beaded or sealed with a permanently elastic mastic type sealant designed for this service.

6. All insulation on fittings, flanges, valves, and other irregular shaped items on which the jacket cannot be neatly applied shall be finished as follows:
 - a. Over the smooth insulation surface and cloth reinforcing as described below, apply the mastic or coating in two coats at a sufficient rate to provide a dry film thickness of 63 mils when using weather barrier mastic or 32 mils when using vapor barrier coating. Lagging adhesive and canvas should be applied at a sufficient rate to apply a tack coat at 60-70 sq. ft per gal. Immediately imbed the selected lagging fabric into the wet coating. Smooth to avoid wrinkles and overlap seams by at least 2 inches. Immediately apply a finish coat at 60-70 sq. ft. per gal. The dry film thickness of this application will vary with the fabric selected.
 - b. The mastic or coating shall be applied by trowel, brush or spray. The exact application conditions, procedures and recoat time shall be as recommended by the coating/mastic manufacturer.
 - c. Reinforcing shall consist of a No. 10 glass or polyester mesh: Foster Mast-a-Fab, Childers Chil Glas #10 or Dynel cloth. Flat surfaces shall be sured to the insulated structure on 18 inch centers maximum.
 - d. Above ambient pipe service temperature: The weather barrier mastic shall be gray or metallic gray vinyl VI-CRYL CP-10-1 or CP-11-1 manufactured by Childers or light aluminum gray WEATHERITE 46-51 manufactured by Foster; or WC-1 manufactured by Vimasco Corporation.
 - e. Below ambient pipe service temperature: The vapor barrier coating shall be white Foster 30-80AF. Coating shall meet ASTM D 5590 with 0 growth rating. Permeance shall be 0.013 perms or less at 43 mils dry as tested by ASTM E 96.

D. TYPE SS – STAINLESS STEEL JACKET ~~AND PITTWRAP:~~

- ~~1. Provide PITTWRAP heat sealable, multiply laminate jacketing system suitable for 190°F. PITTWRAP shall be a minimum of 3 mm thickness.~~
2. Provide directly over the insulation a stainless steel weatherproof jacket. This jacket shall be manufactured from stainless steel alloy **T-304** or **T-316**, not less than **0.020** inch thick. Material shall meet standard ASTM A-240. The jacket shall have a stucco embossed finish. The jacketing shall have a 3 mil polysurlyn moisture barrier (an engineered three-layer coextruded film of polyethylene and Surlyn polymers) factory heat laminated to the interior surface. Polykraft moisture barrier is not acceptable. Jacketing shall conform to standard ASTM C1767, "Standard Specification for Stainless Steel Jacketing for Insulation".
3. The jacketing shall be secured by stainless steel alloy T-304 or T-316 straps, 1/2-inch-wide by 0.020-inch-thick. The straps shall be placed on 12-inch centers (maximum). Each circumferential joint shall have a strap at the midpoint of the lap. Banding shall be secured by stainless steel banding seals.
4. All elbows and tees shall be protected with a prefabricated elbow jacket. The jacket shall be manufactured of high purity 0.020-inch stainless steel with a polysurlyn moisture barrier on the interior of the jacket to prevent decomposition of the jacketing. On diameters where prefabricated jackets are not available the roll jacketing shall be in sections cut on the miter, overlapped, and forming a neat snug fit, using sufficient bands and fasteners to hold jacket properly in place.
5. All joints shall be made rain or drip proof. Longitudinal joints shall be located on the side of the pipe with the open edge of the lap turned down to shed water. Circumferential joints on pipes that do not have enough slope to get a good shingle effect to keep water out of the joint shall have the inside end of the lap beaded or sealed with a permanently elastic mastic type sealant designed for this service.
6. All insulation on fittings, flanges, valves, and other irregular shaped items on which the jacket cannot be neatly applied shall be finished as follows:

- a. Over the smooth insulation surface and cloth reinforcing as described below, apply the mastic or coating in two coats at a sufficient rate to provide a dry film thickness of 63 mils when using weather barrier mastic or 32 mils when using vapor barrier coating. Lagging adhesive and canvas should be applied at a sufficient rate to apply a tack coat at 60-70 sq. ft per gal. Immediately imbed the selected lagging fabric into the wet coating. Smooth to avoid wrinkles and overlap seams by at least 2 inches. Immediately apply a finish coat at 60-70 sq. ft. per gal. The dry film thickness of this application will vary with the fabric selected.
- b. The mastic or coating shall be applied by trowel, brush or spray. The exact application conditions, procedures and recoat time shall be as recommended by the coating/mastic manufacturer.
- c. Reinforcing shall consist of a No. 10 glass or polyester mesh: Foster Mast a Fab, Childers Chil Glas #10 or Dynel cloth. Flat surfaces shall be sured to the insulated structure on 18-inch centers maximum.
- d. Above ambient pipe service temperature: The weather barrier mastic shall be gray or metallic gray vinyl VI-CRYL CP-10-1 or CP-11-1 manufactured by Childers or light aluminum gray WEATHERITE 46-51 manufactured by Foster; or WC-1 manufactured by Vimasco Corporation.
- e. Below ambient pipe service temperature: The vapor barrier coating shall be white Foster 30-80AF. Coating shall meet ASTM D 5590 with 0 growth rating. Permeance shall be 0.013 perms or less at 43 mils dry as tested by ASTM E 96.

2.10 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd. (272 gm per sq. m).
1. Tape Width: 4 inches.
 2. Cloth Standard: MIL-C-20079H, Type I.
 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4-inch-wide, in one of the following materials compatible with jacket:
1. Stainless Steel: Type 304, 0.020 inch thick.
 2. Galvanized Steel: 0.005 inch thick.
 3. Aluminum: 0.007 inch thick.
 4. Brass: 0.01 inch thick.
 5. Nickel-Copper Alloy: 0.005 inch thick.
- C. Wire: 14 gauge nickel copper alloy, 16 gauge, soft-annealed stainless steel, or 16 gauge, soft-annealed galvanized steel.
- D. Corner Angles: 28 gauge, 1 inch by 1 inch, adhered to 2 inches by 2 inches kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds (9 kg) each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.
- F. Vapor Barrier Coating: Water-based, fire-resistive composition.
1. Water Vapor Permeance: 0.013 perm maximum at 43 mil dry film thickness per ASTM E 96.
 2. Temperature Range: Minus 20 to 180°F.
 3. Mold Resistance: Coating shall meet ASTM D 5590 with 0 growth rating.
 4. Design Basis: Foster Vapor Fas 30-80 AF

G. Weatherproof Metal Jacketing/Flashing Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints and flashing.

1. Water Vapor Permeance: ASTM F-1249: 0.014 perm at 0.094 in. dry film thickness.
2. Temperature Range: Minus 40 to 250°F.
3. Color: Aluminum.
4. Design Basis: Foster ELASTOLAR 95-44 or Childers CHIL-BYL CP-76

H. Weather Barrier Mastic: Water based, fire resistive composition used on above ambient pipe/equipment insulation.

1. Water Vapor Permeance: ASTM E-96 Greater than 1.0 perm for 1/16-inch dry film. (Procedure B).
2. Temperature Range: Minus 20 to 180°F.
3. Design Basis: Foster WEATHERITE 46-50 or Childers CP-10/CP-11

I. Insulation Joint Sealant: Used with cellular glass and polyisocyanurate to prevent moisture at longitudinal and butt joints of insulation (below ambient service temperatures only). Elastomer based, vapor barrier sealant.

1. Temperature Range: Minus 100 to 200°F.
2. Color: White or Tan.
3. Design Basis: Foster FLEXTRA 95-50 or Childers CHIL-BYL CP-76

J. Elastomeric Insulation Coating: Used with elastomeric insulation outdoors. Polyacrylate copolymer emulsion; two coats

K. Design Basis: Foster Elastomeric Foam Coating 30-64

2.11 INSULATING STRUCTURAL INSERTS

A. Application: Provide an insulating structural insert at each hanger and pipe support location. Apply high temperature or low temperature system insulating structural inserts per the application table above. NOTE: Structural inserts shall NOT be utilized where pipe rollers are the means of pipe support. In these situations, pipe saddles shall be utilized in lieu of structural inserts. Refer to Section 230529 "Hangers and Supports for Piping and Equipment" for the use of pipe saddles in this application.

B. High Temperature System Structural Insert: (200°F or above): High density (140 psi minimum compressive strength, no deformation) calcium silicate with water repellant rated for temperatures up to 1,200°F. Thickness shall be the same as adjacent pipe insulation. Inserts shall be 180° or 360° arc as required for the type of support. Insert length shall be manufacturers standard but not less than 6-inches. Provide ASTM A 527 galvanized steel protective shield of 360 arc equal to the insert length.

C. Low Temperature System Structural Insert (less than 200°F): High density (50 psi minimum compressive strength, no deformation) polyisocyanurate foam with vapor barrier rated for temperatures up to 300°F. Thickness shall be the same as adjacent pipe insulation. Inserts shall be 180° or 360° arc as required for the type of support. Insert length shall be manufacturers standard but not less than 6-inches. Provide ASTM A-527 galvanized steel protective shield of 360° arc equal to the insert length.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless steel surfaces with demineralized water.

1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Prior to installation of insulating materials, complete painting of pipe welds as indicated by Section 232113 "Basic Piping Materials and Methods".

C. Install vapor barriers on insulated pipes, and equipment having surface operating temperatures below 75°F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Coat all joints and seams of vapor retarder film (ASJ, duct wrap seams, etc.) with vapor barrier coating on all piping, equipment and duct insulation having service operating temperatures below 75°F.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier with flashing sealant.

H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45-degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors for pipes.
2. Vibration control devices.
3. Testing laboratory labels and stamps.
4. Nameplates and data plates.
5. Access panels and doors.
6. Fire protection piping systems.
7. Piping specialties including air chambers and unions.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond elastomeric insulation with adhesive. Seal cellular glass and polyisocyanurate insulation with insulation joint sealant on below ambient service.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35°F.
4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings. Apply reinforcing mesh in conjunction with vapor barrier coating on all below ambient, insulated flanges, unions, valves, and fittings. On ASJ self-sealing lap seams, the use of reinforcing mesh with coating is not mandatory.
5. At penetrations in jackets for thermometers and pressure gauges, fill and seal voids with insulating cement.
6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal with vapor barrier coating. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Exterior Wall Penetrations: For penetrations of below grade exterior walls, extend metal jacket for exterior insulation through penetration to a point 2 inches from interior surface of wall inside the building. Seal ends of metal jacket with vapor barrier coating. Secure metal jacket ends with metal band. At point where insulation metal jacket contacts mechanical sleeve seal, insert cellular glass preformed pipe insulation to allow sleeve seal tightening against metal jacket. Tighten and seal sleeve to jacket to form a watertight seal.

G. Interior Walls, Floors, and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer.

H. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer per UL Details.

I. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating and reinforcing mesh. Apply pre-molded, pre-cut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond elastomeric insulation with adhesive.

1. Use same material and thickness as adjacent pipe insulation.
2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
4. Insulate elbows and tees smaller than 3 inches pipe size with pre-molded insulation.
5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
7. Cover insulation, except for metal jacketed insulation, with 2 layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in this section and in Section 230529 "Hangers and Supports for Piping and Equipment". For cold surface piping, extend insulation on anchor legs and floor supports to a minimum of 12 inches from the pipe and taper and seal insulation ends.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 HIGH PERFORMANCE BLANKET PIPE INSULATION INSTALLATION

- A. Follow the manufacturer's installation guidelines where they differ from the following directions.
- B. Install insulation in the longest sections feasible to reduce the quantity of circumferential joints.
- C. Install multiple layers of insulation to achieve the specified thickness by wrapping the pipe multiple times. Overlap circumferential joints for lower layers of insulation with the following layer a minimum of 6 inches. Avoid placing longitudinal joints of multiple layers at the same circumferential location.
- D. Cover pipe elbows using prefabricated "gore-style" insulation fittings.
- E. Follow manufacturer's detailed instructions for the installation over pipe ends, reducers, tees, piping shoes, valves, and flanges.
- F. Secure insulation in place with metal banding before installing finished jacketing.

3.5 EQUIPMENT INSULATION INSTALLATION, GENERAL

- A. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.
- B. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.
- C. Insulation Thicknesses Greater than 2 inches: Install insulation in multiple layers with staggered joints.
- D. Bevel insulation edges for cylindrical surfaces for tight joint.
- E. Secure sections of insulation in place with wire or bands spaced at 9-inch centers, except for flexible elastomeric cellular insulation.
- F. Protect exposed corners with corner angles under wires and bands.
- G. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- H. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.
- I. Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier coating to a minimum thickness of 31 mils. Install a layer of reinforcing mesh embedded between layers.

3.6 FINISHES

- A. Flexible Elastomeric Cellular Insulation: For outdoor installations, after adhesive has fully cured, apply 2 coats of protective, elastomeric, outdoor coating recommended by manufacturer. Allow the first coat to dry a minimum of two hours before applying the second coat. All applications should be made when the temperature is above 40F. Apply each coat at 200-to 400 ft²/gallon.

END OF SECTION

SECTION 31 62 23.13
STEEL PIPE PILES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 00 and DIVISION 01 which are hereby made a part of this Section of the Specifications. Examine all other Sections of the Specifications for requirements which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- B. Coordinate Work with that of all other trades or contracts affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under the Contract.

1.2 PILE TYPES AND BIDDING LENGTH

- A. Base bids upon the size, capacity and length of piles as indicated and as listed below.

Structure*	Pile Size	Concrete Filled	Concrete Plug	Axial Working Capacity	QTY Test Piles	Minimum Tip Elevation (NAVD88)	Total Bid LF
Pier Piles	24"x0.625"	-	Y	306 kip	2	-	24,810
East Mooring Dolphin	24"x0.625"	Y	-	269 kip	1	-	4,550
West Mooring Dolphin #1	24"x0.625"	Y	-	222 kip	1	-	
West Mooring Dolphin #2	24"x0.625"	Y	-	163 kip	1	-	
Float A	24"x0.625"	Y	-	-	-	-76†	4,300
Float B	24"x0.625"	Y	-	-	-	-76†	
Float C	24"x0.625"	Y	-	-	-	-85†	
Float D	24"x0.625"	Y	-	-	-	-85†	
Float E	24"x0.625"	Y	-	-	-	-85†	
Floating Breakwater	30"x1.00"	Y	-	-	-	-80 with a 5' Rock Socket inclusive†	1,090
Catwalk Support Piles	18" x 0.5"	-	-	20 Kip	-	-76	200

Structure*	Pile Size	Concrete Filled	Concrete Plug at Top of Pile	Design Axial Load	Ultimate Axial Capacity**	QTY Test Piles	Minimum Tip Elevation (NAVD88)	Total Bid LF
Pier Piles	24"x0.625"	-	Y	306 kip	689 kip	2	-	‡
East Mooring Dolphin	24"x0.625"	Y	-	269 kip	605 kip	1	-	‡
West Mooring Dolphin #1	24"x0.625"	Y	-	222 kip	500 kip	1	-	
West Mooring Dolphin #2	24"x0.625"	Y	-	163 kip	367 kip	1	-	
Float A	24"x0.625"	Y	-	-	-	-	-76†	‡
Float B	24"x0.625"	Y	-	-	-	-	-76†	
Float C	24"x0.625"	Y	-	-	-	-	-85†	
Float D	24"x0.625"	Y	-	-	-	-	-85†	
Float E	24"x0.625"	Y	-	-	-	-	-85†	
Floating Breakwater	30"x1.00"	Y	-	-	-	-	As Indicated	‡
Catwalk Support Piles	18"x0.5"		-	20 kip	23 kip	-	-76	200

* Pier piles and mooring dolphin piles shall have rock sockets and rock anchors as indicated.

** Ultimate capacity is based on a 2.25 factor of safety x design load.

† Where bedrock is encountered at a depth shallower than the indicated pile tip elevation, provide a 5-foot rock socket into sound bedrock.

‡ See Contract Drawings for Pile Tables with quantities for bidding.

1.3 DESCRIPTION OF WORK

A. Work under this section includes procurement, installation and testing of all structural steel pipe piles for the pier replacement and extension, the new mooring dolphins, floating breakwater guide piles, catwalk support piles and the floating dock guide piles. Piles are to be installed to the Ultimate Pile Capacities, rock socket embedment depths, and minimum tip elevations indicated in the Contract Drawings and as outlined herein. The Work includes but is not limited to driving or drilling pier and dolphin piles to sound bedrock; socketing piles within bedrock where indicated, to the depths indicated and specified; performing analysis and testing to demonstrate pile capacity; placing concrete within piles (where indicated), installing guide piles to the minimum tip elevations indicated and all other activities required to satisfactorily install structural steel pipe piles, as indicated on the Contract Drawings and specified herein. These other activities include, but are not limited to:

1. Setting and maintaining location and elevation benchmarks at all pipe piles during and after pipe pile installation.
2. Performing and submitting results from a bedrock probing program conducted within the footprint of the new pier, dolphins, floating docks and floating breakwater.

3. Furnishing and installing all new pipe piles or equivalent, to the required locations and capacities, as shown on the Drawings and specified hereinafter. This shall include selecting appropriate pile order lengths and submitting for Engineer's review.
4. Extraction of damaged piles and installation of replacement piles If piles are damaged during installation.
5. Providing for review, a Wave Equation Analysis (WEAP) of the proposed hammer – pile systems. Analysis shall be performed by, or under the direct supervision of, the Contractor's Geotechnical Engineer licensed in the state of Maine and meeting all other criteria specified herein. -
6. ~~Performing, analyzing and submitting results of~~Owner's Engineer will be responsible for performance of Dynamic Pile Testing (PDA) on piles as specified herein. This includes dynamic monitoring and application of Case Pile Wave Analysis Program (CAPWAP) to confirm energy transfer into the piles, demonstrate capability of hammer-pile system to achieve specified pile capacity without damaging piles and develop recommended driving criteria, ~~and production pile lengths. PDA testing and analysis of results shall be performed by, or under the direct supervision of, the Contractor's Geotechnical Engineer who shall be licensed in the state of Maine and shall meeting all other criteria specified herein.~~
- ~~6-7.~~ Contractor shall be responsible for selection of production pile lengths meeting requirements as specified herein.
- ~~7-8.~~ Accommodating rock anchor installation where indicated. Refer to other sections of these specifications and the Contract Drawings for rock anchor requirements.

1.4 REFERENCES

The latest edition of the following:

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISC 325 Steel Construction Manual

AMERICAN WELDING SOCIETY (AWS)
AWS D1.1 Structural Welding Code – Steel

ASTM INTERNATIONAL (ASTM)
ASTM A252/A252M Standard Specification for Welded and Seamless Steel Pipe Piles
ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C109/ C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)
ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C173/C173M Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M Standard Test Method for Air Con
ASTM C1064/C1064M Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM D4945 Standard Test Method for High-Strain Dynamic Testing of Deep Foundations

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
Regulation 29 CFR Part 1926 Occupational Safety and Health

1.5 SUBMITTALS

- A. Action Submittals:

1. No less than 45 days prior to mobilization of pile driving equipment Contractor shall submit a Drivability Study and Wave Equation analysis (WEAP) for each pile/hammer system, for impact and vibratory hammers, which shall be prepared by and bear the stamp of a Professional Engineer registered in the State of Maine.
 - a. Analyses shall demonstrate that the proposed driving system(s) are capable of obtaining the indicated penetration and specified capacities, in conformance with Contract Documents, without damaging the pile and without exceeding 90% of the steel yield stress in compression or tension.
 - b. Energies transferred from the hammer to the pile must be evident in the submitted WEAP analyses. It shall be the Contractor's responsibility to see that reasonable and conservative assumptions be made in the Wave Equation analyses to demonstrate transfer energies for the hammers and respective hammer types.
 - c. The analysis shall account for the proposed hammer system including all cushions, pile cap block, pile preparations, length, and anticipated soil/rock properties.
 - d. A narrative shall be included detailing any assumptions used in performing the analyses and including a summary of Wave Equation input and results, and steel's calculated stresses and yield strength in compression or tension.
 - e. Proposed driving criteria shall be provided for all piles that are to be driven to specified capacities or driven to bedrock and then drilled and socketed into bedrock.
 - f. **Ultimate capacities for piles drilled with rock sockets shall be substantiated by Contractors Geotechnical Engineer in accordance with Paragraph 3.9.G herein.**
2. Shop Drawings: Submit drawings to Engineer no less than 45 days prior to mobilization of pile driving equipment in accordance with the requirements of this Section for the following:
 - a. Identification numbers for steel pipe piling system, to be used in installation records, installation template as needed.
 - b. Anticipated installation sequence for the Work.
 - c. Shop drawings and calculations for falsework and driving template. Submittals shall bear the signature and stamp of a Professional Engineer registered in the State of Maine.
 - d. Steel pipe pile schedule for fabrication, shop assembly, and finishing. Clearly indicate the following for each member:
 - 1) Member type, designation, or shape.
 - 2) Size and length.
 - 3) Type, extent, and weight or thickness of protective coating.
 - 4) Welds using standard AWS notations and symbols, including size length, and type of each weld.
3. Product Data: Submit manufacturer's data to engineer no less than 45 days prior to mobilization of pile driving equipment for the following:
 - a. Steel Materials
 - 1) Steel pipe piling
 - 2) Steel driving shoe
4. ~~PDA and CAPWAP Load Test Results: Within 3 days of completion of PDA testing, Contractor shall submit the results of the PDA and CAPWAP analysis, which shall be prepared by and bear the stamp of a Professional Engineer registered in the State of Maine. Allowable loadLoads shall be as substantiated by dynamic load tests and the satisfactory CAPWAP report for the test piles.~~

B. Informational Submittals:

1. Pipe Pile Work Plan: The Contractor shall submit a Work Plan to Engineer, within 21 days of written notice to proceed. At minimum the Steel Pipe Pile Work Plan shall include a narrative and drawings describing the following:
 - a. Complete descriptive data to demonstrate compliance of the materials, procedures and the equipment with these specifications.
 - b. Include equipment and procedures to be used to perform probing of bedrock as described herein.
 - c. Equipment Data: Provide pile driving vibratory and impact equipment data including type, make, maximum rated energy, rated energy per blow of hammer, weight of hammer, weight of drive cap, details, type and structural properties of hammer cushion, and type of leads. Also provide drill rig and tooling including, type, make, and properties for drilled piles. Include descriptions of equipment and procedures for construction of pipe pile rock socket including drilling in soils, drilling through obstructions and boulders, method to maintain an open hole and rock socket, method to flush drilled hole, method of measuring volumes of grout per pipe pile, and method of pressure and tremie grouting.
 - d. Tabular summary of individual pile identification numbers and pile order lengths for all pile types. Table shall indicate total pile length, embedment below mudline and limits of coating.
 - e. Schedule of associated activities.
 - f. Written description of procedures for installing the pipe piles including, but not limited to, the following:
 - 1) Equipment laydown barge and crane barge position during driving.
 - 2) Procedure for removal of obstructions (above and below soft sediments), if encountered.
 - 3) Procedures for positioning pipe piling.
 - 4) Description of procedures for installing (drilling and driving) pipe piling.
 - 5) Description of procedures for support of PDA pile load testing.
2. Qualification Statement:
 - a. Pile Installer: Submit name and qualifications of operators and foremen to be employed with evidence of suitable experience in this type of installation and of the competence and experience of the person in charge at the Site. As a minimum, the pile-driving Contractor shall furnish evidence of successful, completed, installations of steel pipe piles.
 - b. Drilled Pile Installer: Submit name and qualifications of operators and foremen to be employed.
 - c. Testing Laboratory: Submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance and field quality control testing required in this Section. If more than one laboratory will be employed, submit qualifications for each laboratory and indicate scope of testing assigned to each. Submit to Engineer.
 - d. Contractor's Professional Engineer and Geotechnical Engineer: Submit certification of licensure in the State of Maine and provide a listing of relevant experience, particularly in the use of Pile Dynamic Analysis (PDA) and CAPWAP and the interpretation of analysis results. Pile Analysis.
 - e. Welders: With bid, submit copies of current AWS certifications for each welder employed.
3. Source Quality Control Submittals:

- a. Submit copies of certified mill test reports indicating chemical and physical properties of structural steel of each type furnished under this section. Mill test reports shall be submitted to Engineer prior to installation of the pipe piles.
- b. Submit manufacturer's data for steel pile tip protection.

~~4. Quality Assurance Test Results Submittal:~~

- ~~a. Submit results of quality assurance testing performed in accordance with Paragraph 3.8 of this Section. Submit test results to Engineer within 3 days of test completion.~~

~~5.4. Field Quality Control Submittals:~~

- a. Bedrock Probe Results: Submit results of bedrock probing program prior to submittal of tabular summary of proposed individual pile order lengths for all pile types.
- b. Steel Pipe Piling Installation Records (Logs): Within 2 days of installation of individual steel pipe piles, submit in accordance with Paragraph 3.9 of this Section.
- c. Daily Inspection Logs: Submit in accordance with Paragraph 3.6 of this Section.

C. Closeout Submittals:

1. Within 7 days of receiving request from Owner to submit closeout submittal, unless otherwise agreed to by Owner, submit the following:
 - a. Steel Piling Records: Within 2 days of completion of pile installation, Contractor shall provide Pile Records for the installed pipe piles as defined herein.
 - b. Pipe Pile Survey Record Drawings: Contractor shall provide Survey Record Drawings of pipe pile locations as defined herein.

1.6 QUALITY ASSURANCE

A. Qualifications

1. All piling shall be furnished and installed by a Contractor experienced in the type of piling work specified. The Contractor shall have at least five (5) years of experience and at least 10 successful installations of the same general type and class of piles. The superintendent proposed for the work shall have at least five (5) years of experience in pile driving and shall be experienced in piling operations of this class and nature.
2. Surveying shall be performed by a Professional Land Surveyor hired by the Contractor and licensed in the State of Maine and shall have not less than ten (10) years of experience performing surveys on similar projects.
3. The Contractor's engineer shall be registered in the state in which the work is performed and shall have not less than ten (10) years of experience in pile design on similar projects.

B. Comply with all rules, regulations, laws, and ordinances of the State of Maine and all other authorities having jurisdiction. All labor, materials, equipment, and services necessary to make work comply with such requirements shall be provided without additional cost to the Owner.

C. Perform all pile installation in the presence of Engineer. Piles not installed in the presence of the Engineer will not be accepted.

1.7 LINE AND GRADE CONTROL

A. Contractor shall be responsible for establishing and maintaining line and grade control for all aspects of the Work as shown on the Drawings and described in Section 02 21 00 - Surveys. All survey Work

conducted on the project shall correspond to the Site coordinate system and vertical datum as shown on the Drawings.

1.8 DELIVERY, HANDLING, AND STORAGE

- A. All materials shall be delivered and handled with due care and all work shall be protected in order to avoid damage or deterioration before, during, or after installation at the project site.
- B. Materials shall be handled and stored in a manner to prevent excessive bending stresses and damage to the piles. Store materials in orderly groups above grade. Block during storage to minimize possible distortion of members. Any member exhibiting variations beyond tolerance limits will be considered distorted and may not be used in the work. Keep steel free from excessive rust.
- C. The Contractor shall store and handle piles to avoid damage to the piles and coating. Contractor shall protect coating on piles during handling, driving, and falsework construction. Contractor shall repair any damage to coating per the coating manufacturer's recommendations and to the satisfaction of Engineer as soon as practical after damage occurs.
- D. The Contractor shall submit to the Owner storage procedures and requirements for all materials supplied by Contractor as part of this Contract.
- E. The Contractor shall perform all work in a manner causing the least possible obstruction to other construction or to the Owner's and abutting property owner's operations or navigation. **and Contractor** shall protect all property of the Owner from any unnecessary obstructions and any injury or loss attributable to the Contractor's operations. The Contractor shall repair, replace and/or compensate the applicable party for any such damage, injury or loss.

1.9 PROJECT CONDITIONS

- A. Coordinate Work with that of other trades affected by Work of this Section and cooperate with such trades to assure the steady progress of the Work.
- B. Visit the Site to review all details of the Work and working conditions and to verify dimensions in the field including headroom and interferences from adjacent structures and utilities. Notify Engineer in writing of any discrepancy before performing any Work.
- C. Maintain existing Site access as much as practical during Work. Restore Site access as necessary to provide adequate Site ingress/egress during construction.
- D. Contractor shall perform all Work in a manner causing the least possible obstruction to daily operations and shall protect all property from any unnecessary obstructions and any injury or loss attributable to the Contractor's operations. The Contractor shall repair, replace and/or compensate the applicable party for any such damage, injury or loss.
- E. Protect existing utilities to remain within the work area in accordance with the requirements of authorities having jurisdiction over same

1.10 SCHEDULING AND COORDINATION

- A. Schedule Work to perform driving during hours as approved by the Owner, as specified and in accordance with permits and local ordinances.
- B. In-water pile driving shall be performed in accordance with regulatory and environmental permits obtained by the Owner.

~~C. Do not install piles until all waterfront removals and demolition within 20 feet of pile driving has been performed as required to complete the work specified herein.~~

~~D.C.~~ Coordinate with the Owner as to the relocation of any utilities prior to pile driving.

1.11 SUBSURFACE SOIL DATA

- A. Contractor shall be aware of all relevant Site conditions, including river bathymetry, subsurface geology, existing bulkheads, groundwater elevations, and soil and groundwater environmental chemistry data. No request for additional compensation for differing Site conditions will be approved by Owner.
- B. The subsurface data are provided for general information. The Technical Data contained therein, upon which Contractor is entitled to rely, may be considered accurate only at the particular locations and times the subsurface explorations were made. It is Contractor's responsibility to make interpretations and to draw conclusions based on the character of materials to be encountered and the impact to his work based on his knowledge of the area and of earthwork techniques. The actual conditions between the explorations may vary. Other interpretations of the subsurface data referenced in the Specifications are possible. Neither the Owner nor the Engineer makes any representation or guarantee as to data accuracy, completeness or pertinence, and in addition, shall not be responsible for the conclusions to be drawn therefrom. The data are made available to the Contractor merely for the purpose of providing them with such information as is in the possession of the Owner, whether or not such information may be accurate, complete or pertinent or of any value to the Contractor.
- C. Soil borings and other exploratory operations may be made by Contractor, at no additional cost to Owner. Coordinate Contractor-performed test borings and other exploratory operations with Owner, utility owners, other contractors, and others performing work for Owner as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of Owner, utility owners, other contractors, users of abutting properties and waterways, and others performing work for Owner. Comply with Laws and Regulations relative to required notifications.

PART 2 - PRODUCTS

2.1 STEEL PIPE PILES

- A. Steel pipe piles shall be new ERW or Spiral weld and conform to the requirements of ASTM A 252, Grade 3. Piles shall be of the size indicated on the drawings. Welds shall be double fused beveled submerged arc welds in accordance with AWS requirements. ~~Spiral lap fabrication will not be permitted.~~ Pipe piles shall be coated as specified herein.
 - 1. Maximum one splice per pile. All splices shall be completed in the fabrication shop and fully develop the capacity of the pipe pile. Field splices shall be minimized or eliminated if possible and performed in accordance with the requirements herein.
 - 2. Prior to installation, piles shall be marked with horizontal lines at intervals sufficient to determine the pile tip elevation during installation. Markings shall be made at a spacing no greater than 60 inches for the majority of the pile and 12 inches within 5 feet of the cut-off elevation. **All test piles shall be marked every 12 inches along the entire pile length.**
 - 3. Steel Pipes shall be driven with outside flange or inside flange open end steel cutting shoes and of sufficient length to obtain satisfactory bearing on rock.

2.2 CONCRETE

- A. Concrete used for pile infill ~~and pile plugs~~ shall conform to the requirements as identified in Section 03 31 30 – Marine Concrete.

2.3 PROTECTIVE COATING

- A. Protective Coatings shall be in accordance with Section 09 97 13.26 – Coating of Steel Waterfront Structures

2.4 PVC PILE CAP

- A. PVC Pile caps for floating dock and breakwater guide piles shall be cone-shaped, white, UV-resistant, polyethylene PVC pile caps suitable to fit on the top of pile.

2.5 TEMPORARY FALSEWORK AND FRAMING

- A. The Contractor shall provide temporary falsework and/or framing as required to locate and guide the piles during installation. The falsework shall be so constructed as to achieve the required pile driving tolerances specified herein without damaging the pile or coating.

2.6 CUTTING/DRIVING SHOES

- A. Pipe piles shall be equipped with open ended driving shoe or steel cutting shoes. Driving shoe or cutting shoe shall be equipped to allow for drilling of bedrock inside the pipe. Driving shoe or cutting shoes shall be welded in accordance with Section 05 05 23.16 – Structural Welding.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Impact hammer shall be on-Site at all times during pile driving operations. The Contractor shall provide and maintain in good operating condition all equipment necessary for the proper and efficient handling and installation of piles. The Contractor shall submit to the Owner and Engineer specifications for the type, size and configuration of the proposed pile driving equipment.
- B. Hammers shall at all times be operated at rates and energy outputs recommended by the manufacturer for the driving conditions encountered and as recommended by ~~the Contractor's Geotechnical Engineer following~~ WEAP, PDA and CAPWAP analysis, and as accepted by the Engineer. Contractor shall demonstrate piles have achieved ~~the specified~~ ultimate capacity by driving each pile with an impact hammer as determined by CAPWAP.
- C. When driving with an impact hammer, place driving helmet or cap and cushion block combination capable of protecting the head of the pile between the top of the pile and the ram to prevent impact damage to the pile. If ~~cap and cushion~~ block is damaged, split, highly compressed, spongy, charred, burned, or deteriorated in any way, replace it with a new block. The helmet or block shall uniformly transmit energy to the pile and minimize the loss of energy.
- D. The top of the pile shall be protected during driving.
- E. The type and quantity of equipment furnished shall be sufficient to complete the Work within the specified time. If at any time during the Work, the Engineer determines that satisfactory results are not being obtained with Contractor's equipment, Contractor shall provide equipment of other rated capacity, shown to be satisfactory through WEAP ~~at no additional cost to Owner. Additionally, Contractor shall be responsible for all additional costs associated with additional PDA testing. , PDA and CAPWAP analysis and meeting the Engineer's approval shall be supplied and used.~~
- F. Use a suitable driving head to prevent excessive upsetting or damaging of pile heads under driving.

- G. Contractor shall perform daily inspections of equipment on Site for any deficiencies and/or damage prior to use to assure a safe working order.

3.2 PROBING OF BEDROCK

- A. Prior to ordering of piles, Contractor shall probe along the proposed pier bents, guide piles, and mooring dolphins to the extents shown on the Drawings. The intent of probing is to assess top of competent bedrock and any obstructions that may impact the installation of the steel pipe piles.
- B. At a minimum Contractor shall probe at one (1) location at every pier bent location, alternating between the front and back of the pier head. Probes shall be driven to refusal or top of bedrock, whichever comes first. If refusal on a potential obstruction is encountered while probing above the anticipated bedrock elevation, Contractor shall remove the probe (sacrificial steel pile) and re-probe 5 feet on either side of the obstruction. Contractor shall continue re-probing until the limits and elevations of the obstruction are defined. At the start of the probing program, Contractor shall probe at an existing test boring location where bedrock has been cored, to demonstrate Contractors means and methods of probing are able to demonstrate top of apparent bedrock. Contractor shall adjust probing methods at no additional cost to Owner, if probing methods are unable to demonstrate identification of top of bedrock.
- C. Contractor shall be responsible for establishing and maintaining line and grade control as described herein. Contractor shall document, by survey, probe locations/elevations and encountered obstructions, if encountered.
- D. Contractor shall exercise care during probing to avoid damaging and disrupting existing structures and utilities to remain. Repairs of damage to existing structures and utilities resulting from the Work exceeding the movement, deformation, and vibration limits outlined in Section 02 22 13 – Movement and Vibration Assessment shall be performed at the expense of the Contractor, at no additional cost to the Owner. Contractor will not be entitled to extension of schedule or additional costs resulting from any such work stoppage.

3.3 INSTALLATION

A. General

1. The Contractor shall schedule the installation sequence so that no piling shall be ~~installed-driven~~ within 50 feet of concrete less than 7 days old and no piling shall be drilled within 15 feet of concrete less than 3 days old. These requirements may be modified at the time of pile installation provided the Contractor is able to, unless otherwise demonstrate through agreed upon field methods the following:
 - a. 3 Day Concrete: Peak particle velocity at concrete does not exceed 1 inch per second.
 - b. 7 Day Concrete: Peak particle velocity at concrete does not exceed 2 inches per second.
2. Modifications to the approach outlined in paragraph 3.3.A.1 shall be submitted to Owner's Engineer for review and approval at least 3 days prior to Work modifications.
3. Piles shall be verified to be of sufficient dimension, wall thickness, form, and strength, to resist all forces imposed upon it by the hammer to prevent distortion, collapse, or failure.
4. It is intended that all piles shall be installed to cut-off, tip elevations, rock socket depth and minimum ultimate capacities specified.
5. Pile lengths necessary to provide the specified design capacity and embedment depths or tip elevations shall be determined by the Contractor and submitted to the Engineer for review.

6. The responsibility of furnishing pile lengths satisfactory to achieve the design pile capacity, embedment depth or tip elevation as indicated, shall rest solely with the Contractor, regardless of review by the Engineer for any methods or procedures submitted by the Contractor.
7. If departures from the Drawings and Specifications are deemed necessary, reasons therefore shall be submitted to the Engineer for his review. Accepted departures shall be made at no additional cost to the Owner.
8. Contractor shall verify existing conditions and protect all structures, underground and above ground utilities before starting Work. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the Site of the Work.
9. Provide temporary wales, templates, or guide structures as necessary to ensure that the piles are placed and installed to the required alignment and within the tolerances specified herein.

B. Templates

1. The Contractor shall review the planned falsework and driving sequences with the material manufacturer and the Engineer to ensure they are in keeping with accepted practices.
2. Prior to driving, provide a template or driving frame suitable for aligning, supporting, and maintaining the pipe piles, in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the pipe piles until the design tip elevation is achieved and until sufficient elements of the pier superstructure that may be required to maintain position of the pile, are completed. With respect to maintaining its stability during pile installation, the design of the template shall also take into account the project soil conditions and exposure to currents.
3. Templates shall not move when supporting the pipe piling.

C. Pile Installation

1. All pipe pile installation shall be performed in the presence of the Engineer. A minimum of 48 hours' notice shall be given in advance of installation operations. Each pile shall be installed continuously and without interruption to the required tip elevation.
2. Jetting will not be permitted.
3. Maintain indicated pile alignment during installation.
4. For driven piles, the use of vibratory hammers shall be discontinued and impact hammers employed when the penetration rate due to vibratory loading is less than the defined refusal criteria set forth by the WEAP analysis. A protecting cap shall be employed during driving when using impact hammers to prevent damage to the tops of pilings. Pilings damaged during driving shall be removed and replaced at the Contractor's expense.
5. A "slow start" technique shall be utilized during installation of piles to ensure that any mobile marine species in the project impact area have time to move away from the noise source and reduce the likelihood of exposing the marine animals to sound levels that cause injury. The "slow start" technique shall be employed at the beginning of each pile-driving session and when hammering ceases for more than 30 minutes. The following shall be employed for each hammer type:
 - a. For vibratory hammers, the pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15-seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
 - b. For impact hammers, there will be an initial set of three strikes at 40 percent energy, followed by a one-minute waiting period. This sequence of three strikes at reduced energy, one-

minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.

6. Drilled piles shall be drilled with equipment adequate to obtain the required alignment and plane throughout the full length/depth of the hole. A template, spacers, or other approved method shall be used by the Contractor to keep the horizontal and vertical alignment of the drill holes and maintain pile alignment.
7. The equipment shall be capable of accomplishing the drilling without undermining or causing subsidence of the ground or facilities above the drilled hole. Drill tooling shall be capable of penetrating existing subsurface structures such as rock fill and boulders. Drilling equipment may be rotary, auger or percussion utilizing open-end casing, provided wash fluid and cuttings return through the inside of the casing or pile. Equipment shall be capable of installing the pipe piles to the specified elevations and within the tolerances presented herein and on the Drawings.
8. Pilings found to be bowed shall be replaced at the Contractor's expense.
9. Piles shall be undamaged after installation. If piles are installed out of the specified tolerances, notify the Engineer and Owner immediately. No payment will be allowed for additional piles required by improper installation.
10. Avoid subjecting piles to excessive or undue stress. Any pile installed in the wrong position or damaged by reason of defects or by installation, shall be withdrawn and replaced by a new pile. No payment shall be made for the unacceptable pile and the Contractor shall be responsible for the actual replacement of the pile, at no additional cost to the Owner.

3.4 OBSTRUCTIONS

- A. All rocks, timbers, debris or other obstructions which interfere with driving or drilling of the piles, shall be penetrated, cored or removed by the Contractor, at no additional cost to the Owner. Do not set piles until mudline is clear of debris or other material interfering with pile driving. Such debris and obstructions shall be removed. Excavation for the removal of obstructions shall be limited to one pile location at any one time. Any excavation required to clear debris from the mudline, that extends below the existing mudline five (5) feet or more, shall be filled with crushed stone. Fill may be placed before or after pile installation.
- B. If an abrupt increase in driving resistance is encountered, the driving shall be stopped. If the pile has not been advanced to the indicated tip elevation at the time that driving is stopped, the Contractor shall notify the Engineer and shall, subject to the acceptance of the Engineer, extract the pile and attempt to clear the obstruction by spudding, probing or drill through the obstruction or presplit the obstruction.
- C. The Contractor shall, subject to the acceptance of the Engineer, select a method of coring or drilling compatible with material through which the hole is to be made. The hole shall be advanced by drilling and/or chopping inside a temporary steel liner or casing. Pilot holes may be advanced to determine the extent of obstruction, but blasting in either the pilot holes or in the full diameter holes will not be permitted. Coring or drilling shall proceed only to the depth required to penetrate the obstruction.
- D. All spoil shall be controlled to minimize disturbance to site conditions and hindrances to pile installation procedures and requirements. Spoil and waste material shall be collected and removed from the site by the Contractor.
- E. Details of the coring or drilling equipment and methods shall be submitted to the Engineer for review, at least two weeks prior to beginning the work.
- F. If it is agreed by all parties that an obstruction cannot be cleared by spudding, probing, excavation, or drilling and if other methods selected by the Contractor and accepted by the Owner are employed to advance the pile, then the determination of any changes in the Contract Price or changes in the Contract Time relating to time, equipment or personnel required to employ such other methods will be established.

3.43.5 LOCATION

G.A. Piles shall be installed in vertical alignment. Manipulation of piles to force them into position will not be permitted. Piles shall be checked for heave. Additional work required due to improper location of piles shall be the responsibility of Contractor and shall be performed at no additional cost to Owner.

3.43.6 TOLERANCES AND ALIGNMENT

H.A. Guide Piles: A lateral deviation from the location shown on the Drawings and as coordinated with the float manufacturer of not more than 2 inches at the cut-off elevation will be permitted. Piles shall be driven with a maximum permissible deviation of 0.25 inches in 10 feet from the vertical. The design relative position of group piles shall be maintained by the use of templates or by other approved means. If the pile as driven does not meet the requirements, it shall be pulled and re-driven by Contractor at no additional cost to Owner.

H.B. Pier and Mooring Dolphin Piles:

1. A lateral deviation from the designed location shown on the Drawings at the cut-off elevation of not more than 3 inches will be permitted. Piles shall be driven with a maximum permissible vertical deviation of 1 inch in 10 feet. If the pile does not meet the requirements, it shall be pulled and re-driven by the Contractor at no additional cost to the Owner.

3-2. Contractor shall be responsible to notify Engineer immediately if any piles exhibit deviations beyond those stated above. All deviations greater than 3 inches horizontally and 1 inch in 10 feet vertically shall be subject to approval by Engineer prior to acceptance.

4-3. A vertical deviation of not more than 1 inch from the indicated cutoff elevation shown on the drawings will be permitted.

5-4. Contractor shall provide field survey of all piles immediately after driving to confirm horizontal position and to establish vertical location of the pile head.

3.53.7 FIELD SPLICES

A. Splices shall be full penetration butt welds. Ends of the pile sections to be spliced shall be cut square and flush, and extreme care shall be exercised to assure proper alignment.

B. Splices shall be avoided as much as practicable, and splices shall extend a minimum of 5 ft below mudline. No more than one splice will be allowed per pile.

3.6 CONCRETE PLUG FOR ROCK ANCHORS

~~A. Concrete plugs shall be installed at bottom of pipe piles with rock anchors prior to rock anchor installation. Inside of piles shall be drilled and cleaned out to bottom of pile prior to placement of concrete.~~

3.73.8 ROCK SOCKET INSTALLATION

1. Rock Sockets drilled hole diameter shall not exceeds 1" greater than the pipe diameter.

2. Drill holes to the required depth of embedment in the bearing strata.

a. Use approved drill casing where portions thereof will remain as permanent casing.

b. Maintain and verify that borehole is open and clear for installation of the steel pipe pile and cement grout.

- c. ~~Achieve the minimum borehole diameter shown on the Drawings.~~ Diameter shall be determined by outside diameter of drill bit or coring shoe unless the Contractor can verify that a larger diameter is developed by installation techniques.

~~3-83.9~~ PILE TESTING

- A. The Contractor ~~will shall~~ perform a Wave Equation Analysis of Piles (WEAP) for each pile and hammer combination to assure that the pile driving equipment can safely drive the piles to the required capacity.
- B. Prior to any other pier pile installation, Dynamic Pile Testing (PDA) ~~shall will~~ be performed by ~~the Contractor~~ ~~Owner's Engineer~~ on two (2) production pier piles, to establish driving criteria and pile lengths and to confirm energy transfer into the piles. Similarly, the first pile at each of the mooring dolphins ~~shall will~~ be subject to Dynamic Pile Testing (PDA). It is anticipated that the test pile(s) will be driven on one workday, with the re-strikes taking place a minimum of 24 hours later. The PDA testing ~~shall will~~ be evaluated using CAPWAP. ~~The Contractor shall provide access to and cooperate with the Engineer throughout the test program.~~ ~~The Contractor~~ ~~Contractor shall shall~~ also notify the ~~Engineer~~ ~~Owner's Engineer~~ at least 72 hours in advance of driving of the test piles. Test piles may be used as production piles, provided they have been driven in accordance with the final driving criteria.

Pile load tests shall be dynamic load tests in accordance with the Standard Test Method for High-Strain Testing of Piles: ASTM D 4945. The dynamic tests are to be performed ~~by or under the direct supervision of the by Contractor's Geotechnical~~ ~~Owner's Engineer.~~ ~~The same Contractor's Engineer conducting the wave equation analysis shall perform the dynamic load tests.~~ Each test ~~shall will~~ also include a CAPWAP analysis in order to closely model actual field conditions. ~~The Contractor's Engineer shall be experienced in the use of the Pile Dynamic Analysis (PDA) equipment and its purpose related to pile capacity determinations. Dynamic measurements shall be reported to the Owner's Engineer and include items specified in Section 7 of ASTM D4945.~~

~~1.~~ Retain appropriate tests in subparagraphs below. Insert optional loading apparatus and loading procedures if required.

~~2-1.~~ Before placement of the pile in the leads, the Contractor shall ~~predrill test piles formake the designated piles available for predrilling the~~ required instrument attachment ~~to~~ holes. The Contractor shall furnish the equipment, materials, and labor necessary for drilling holes in the piles for mounting the instruments. The instruments will be attached near the head of the pile with bolts placed through drilled holes on the steel piles ~~as shown on Attachment~~.

~~3-2.~~ The Contractor shall provide the ~~Contractor's Geotechnical~~ ~~Owner's~~ Engineer with reasonable means of access to the pile for attaching instrument after the pile is place in the leads.

~~4-3.~~ With the dynamic testing equipment attached, the Contractor shall drive the pile to the depth at which the dynamic test equipment indicates that the ultimate pile capacity and the stopping criteria have been achieved, unless directed otherwise by the Owner. The stresses in the piles shall be monitored during driving with the dynamic test equipment to ensure that the values determined do not exceed the maximum allowable driving stresses. If necessary, the Contractor shall reduce the driving energy transmitted to the pile by using additional cushions or reducing the energy output of the hammer in order to maintain stresses at or below the allowable values. If non-axial driving is indicated by dynamic test equipment measurements, the Contractor shall immediately realign the driving system.

~~5-4.~~ To perform the required re-strike of each test pile, the Contractor shall wait at least 24 hours and, after the instruments are reattached, restrrike the dynamic load test pile. A cold hammer shall not be used for the re-strike. The hammer shall be warmed up before restrrike begins by applying at least 20 blows to another pile. The maximum amount of penetration required during re-strike shall be 6 inches or the maximum total number of hammer blows required will be 50, whichever occurs first. After re-striking, and within three days of the completion of testing, the ~~Contractor~~

~~shall~~ Owner's Engineer supply the ~~Owner-Contractor~~ with a report of the test results of each dynamically tested pile and a CAPWAP analysis.

~~6. Pile Design Load: As indicated on Contract Drawings.~~

- C. Approval Criteria: Allowable load shall be as substantiated by dynamic load tests and the satisfactory CAPWAP report for the test piles.
- D. Upon satisfactory completion of each dynamic load test, a Pile Performance Report ~~shall~~ will be submitted for the Contractor by the ~~Contractor's Geotechnical~~ Owner's Engineer. Submittal ~~shall~~ will be made within three working days of the completion of the dynamic load test.
- E. The report for the Dynamic Pile Analysis ~~shall~~ will contain the following information:
 - i. Bearing capacity of pile from Case Pile Wave Analysis Program (CAPWAP). Information resulting from analysis of a selected restrrike blow.
 - ii. Maximum and final transferred energy, hammer system efficiency during pile installation.
 - iii. Maximum compressive stress, velocity, acceleration and displacement.
 - iv. Maximum tensile stress in pile.
 - v. Pile structural integrity, damage detection, extent and location.
 - vi. Blows per minute and blow number.
 - vii. Input and reflection values of force and velocity, upward and downward traveling force wave with time.
 - viii. Pile skin friction and toe resistance distribution.
 - ix. Maximum energy transferred to pile.
- F. ~~Contractor is responsible for driving piles (with no rock sockets) to the ultimate capacity without damaging the piles. Driving criteria established by Owner's Engineer based on load testing will have to demonstrate the minimum ultimate capacity (outlined in paragraph 1.2 herein) have been achieved.~~
- G. ~~Contractor shall engage a third party Geotechnical Engineer licensed in the State of Maine to demonstrate by static hand calculations that all rock socketed piles including but not limited to Pier piles, Mooring Dolphin Piles, Catwalk Support piles will achieve the ultimate capacity (outlined in paragraph 1.2 herein). The ultimate pile capacity and driving criteria will be proposed by the Contractor's Geotechnical Engineer based upon the results of a satisfactory pile load test conducted on a pile driven as specified herein).~~

~~3.93.10~~ RECORDS

- A. Contractor shall prepare a drawing giving an identification number for each pile and submit this drawing to Engineer prior to pile driving.
- B. Contractor shall keep a complete and accurate record of all observations as to actual pile locations and uplift after driving. Records shall be signed by Contractor's superintendent and filed daily with Engineer. The record is to include for each pile:
 - 1. The date and time of installation;
 - 2. Type, model and size of hammer;
 - 3. Pile size;
 - 4. Final level of penetration, shown by pile tip elevation;
 - 5. Length of embedment of the pipe pile;
 - 6. Pertinent notes as to unusual behavior of a pile; and
 - 7. Pile location referenced to base lines.

- C. Contractor shall be responsible for achieving the pile locations and elevations specified herein and on the Drawings within tolerances specified. After completing pile driving, Contractor shall perform surveys in accordance with survey requirements. The As-built Record Drawing shall indicate the pile identification number; North-South and East-West deviation from plan location surveyed to the nearest 0.01 foot; final tip elevation to the nearest 0.01 foot; and verticality measured to the nearest 0.01 foot over 4 feet.
- D. Failure of Contractor to properly maintain and transmit such records as required under this Section will invalidate Contractor's claims arising from dispute or alleged extra work.

3.103.11 REJECTED PILES

- A. Contractor shall remove and replace any pile that is kinked, bent, damaged, or otherwise impaired for its intended use due to internal defects, improper handling, or improper installation.
- B. Repair pile coating damage as early as practicable to the approval of Engineer. Damage occurring during delivery and handling shall be repaired prior to installation.

3.113.12 QUALITY CONTROL

- A. Concrete testing of pile infill and pile plugs shall conform to the requirements as identified in Section 03 31 30 – Marine Concrete.
- B. During concrete fill placement, fresh concrete shall be tested for slump (ASTM C 143), temperature (ASTM C 1064) and air content (ASTM C 173 or ASTM C 231). Test cylinders shall be made by a testing service provided and paid for by the Contractor for 28-day compressive strength tests (ASTM C 39). At least two specimens shall be taken from each random batch and one test will be made for every ten piles with no less than one test for any single day's operation.

3.123.13 PROTECTION OF WATER RESOURCES

- A. The Contractor shall not discharge fuel oil, sewage, septic water or other deleterious substances into the river or drainage facilities in accordance with Section 01 35 43 – Environmental Procedures.
- B. The Contractor shall contain and collect all floating debris that result from the Work. Floating debris and soil trash shall be collected and disposed of in accordance with the Contract Documents.

Attachment

PreDrilled Test Pile Hole Locations

END OF SECTION

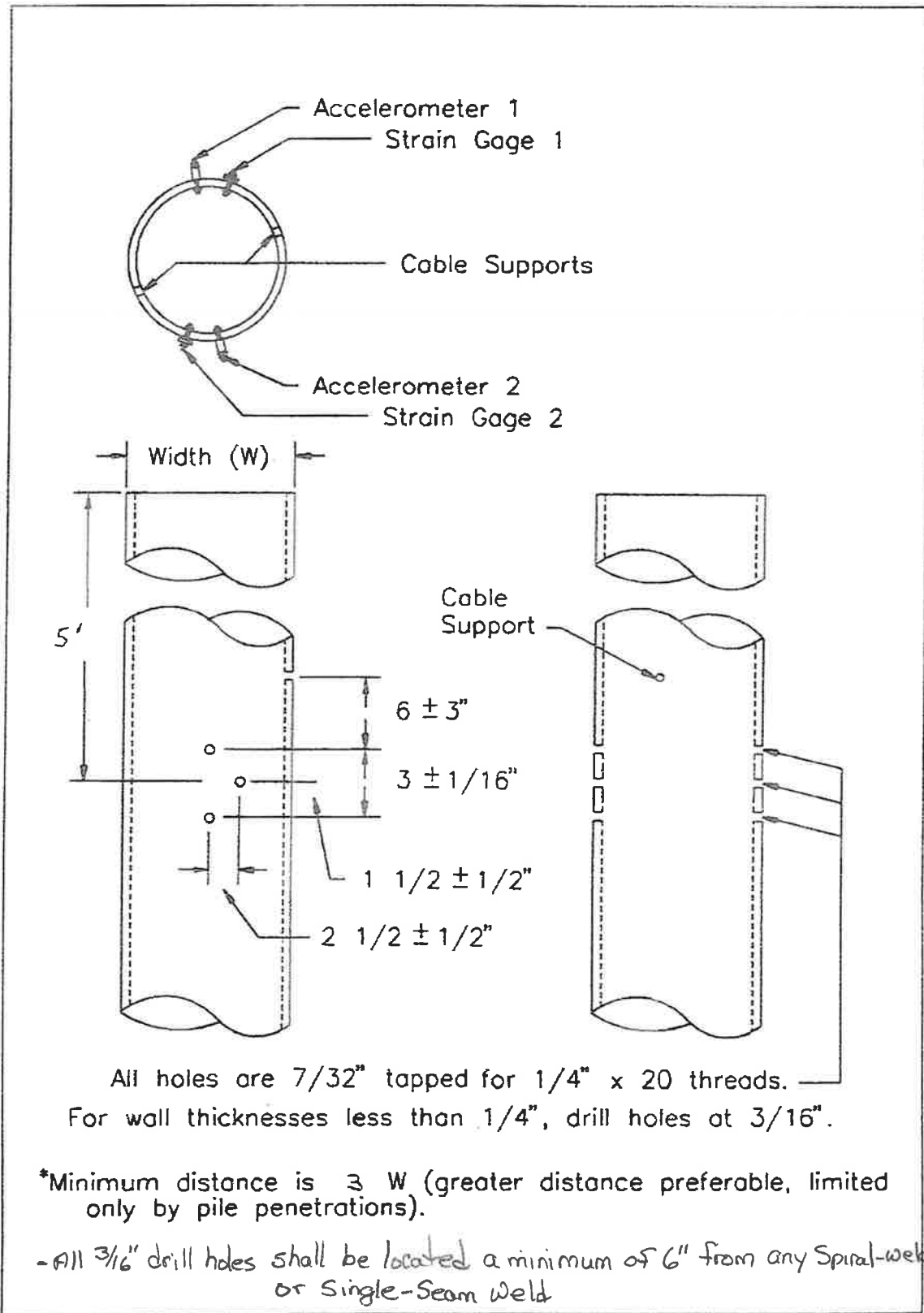


Figure 3.6.4: Transducer bolt arrangements for pipe piles

SECTION 31 68 13
ROCK ANCHORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 00 and DIVISION 01 which are hereby made a part of this Section of the Specifications. Examine all other Sections of the Specifications for requirements which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- B. Coordinate Work with that of all other trades or contracts affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under the Contract.

1.2 DESCRIPTION OF WORK

- A. Provide materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Procurement, installation and testing of rock anchors for mooring dolphin tension steel pipe piles and pier tension steel pipe piles as shown on the Contract Drawings and as specified herein.
 - 2. Providing rock anchors as indicated in the Contract Drawings, tested as specified, meeting the criteria specified herein, and capable of resisting the Design Working Load (DL) listed below:

Pier Anchors	DL = 110 kips
East Dolphin Anchors	DL = 120 kips
West Dolphin #1 Anchors	DL = 80 kips
West Dolphin #2 Anchors	DL = 25 kips
 - 3. Providing specified documentation demonstrating that all material and performance requirements for rock anchors have been met, including procurement, installation and testing of sacrificial anchors.

1.3 REFERENCES

The latest edition of the following:

ASTM INTERNATIONAL (ASTM)

- ASTM A722/A722M High-Strength Steel Bars for Prestressed Concrete
- ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars
- ASTM A934/A934M Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
- ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-in. or [50 mm] Cube Specimens)
- ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- ASTM D1143/D1143M Standard Test Method for Deep Foundation Elements Under Static Axial Compressive Load
- ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials

ASTM D4066 Standard Classification System for Nylon Injection and Extrusion Materials (PA)

POST-TENSIONING INSTITUTE (PTI)
PTI-DC35.1-14, 2014: Recommendations for Prestressed Rock and Soil Anchors

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
Regulation 29 CFR Part 1926 Occupational Safety and Health

FEDERAL HIGHWAY ADMINISTRATION (FHWA)
Geotechnical Engineering Circular No. 4, Ground Anchors and Anchored Systems, FHWA 1999.

1.4 SUBMITTALS

A. Action Submittals:

1. Design Submittals: Not less than 21 days prior to start of rock anchor installation, submit delegated design submittals to Engineer in accordance with the requirements of this Section for the following:
 - a. Rock anchor design signed and stamped by a Registered Professional Engineer in the State of Maine. The Contractor shall prepare drawings and calculations for the rock anchor systems. At a minimum the rock design submittals(s) shall include the following:
 - 1) Calculations and details for each rock anchor type for fabrication, shop assembly, and finishing. For each type of rock anchor indicate the design load, type and size of steel tendons, socket lengths, total lengths, corrosion protection (coatings, double corrosion protection materials), centralizers, and anchor attachments (plates, nuts).
 - 2) Grout mix design, including chemical test results for additives/admixtures prepared by an independent testing laboratory.
 - 3) Calculations and details for falsework and templates to support drills rigs, materials, and/or other pertinent equipment for installation of rock anchors.
2. Product Data:
 - a. Anchor tendon, couplers, anchor head, centralizers.
 - b. Double Corrosion Protection: Tubing, sleeves, grout, test performance data, and application instructions.
 - c. Submit the applicable literature from the anchor manufacturer showing the details, recommended installation procedures, yield and ultimate strength of steel and cross-sectional area not less than two weeks prior to quantity purchase of anchors.
3. Load test information: Submit load test information including load test locations, procedures, and equipment as specified herein to Engineer not less than 21 days prior to start of Work. Provide shop drawings with details of the load test setup including test anchor location, reaction system layout, load cell and hydraulic jack, tell tales or strain gauges, and anticipated subsurface conditions at the test pile location. Provide reaction system design calculations prepared by a Professional Engineer registered in the State of Maine. Provide calibration records for the load cell and hydraulic jack to be used, prior to the load test. Submit load test data as specified in this Section. Drilling for load test rock anchors shall not begin until load test procedures and equipment have been reviewed by engineer. Submit separate load test information submittals for the following:
 - a. Initial Sacrificial Test Anchors
 - b. Performance Test Anchors
 - c. Proof Test Anchors

B. Informational Submittals:

1. The Contractor shall submit a Rock Anchor Work Plan to Engineer, not less than 21 days prior to starting Rock Anchor Work. At a minimum, the Rock Anchor Work Plan shall include a narrative and drawings describing the following:
 - a. Complete descriptive data to demonstrate compliance of the materials, procedures and the equipment with these specifications. Include written narrative describing the approach to rock anchor installation.
 - b. Equipment Data: Provide drill rig, tooling, and anchor testing equipment including type, make, and properties. Include descriptions of equipment and procedures for construction of rock anchors including drilling in soils, drilling through obstructions and boulders, method to maintain an open hole, method to flush drilled hole, method of installing anchor tendon, method of measuring volumes of grout per rock anchor and method of tremie and pressure grouting.
 - c. Tabular summary of individual anchor identification numbers and anchor order lengths for all anchor types.
 - d. Storage procedures of all materials as described herein.
2. Qualification Statement:
 - a. Anchor Installer: With bid, submit name and qualifications of drilling operators and foremen to be employed.
 - b. Testing Laboratory: With bid, submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance and field quality control testing required in this Section. If more than one laboratory will be employed, submit qualifications statement for each laboratory and indicate scope of testing assigned to each.
3. Source Quality Control Submittals:
 - a. Submit epoxy coating test reports within two days of dry film thickness tests.
 - b. Submit copies of certified mill test reports indicating chemical and physical properties of structural steel of each type furnished under this section. Mill test reports shall be submitted to Engineer prior to installation of anchors.
4. Quality Assurance Test Results Submittal
 - a. Submit results of quality assurance testing performed in accordance with paragraph 1.5 of this Section. Submit test results to Engineer within 2 days of test completion.
5. Field Quality Control Submittals:
 - a. Initial Sacrificial Anchor Test Records: Submit within 2 days of completion of testing and in accordance with paragraph 3.3 of this Section.
 - b. Performance and Proof Anchor Test Records: Submit within 2 days of completion of each test and in accordance with paragraph 3.3 of this Section.
 - c. Grout Cube Laboratory Testing: Submit within 2 days of completion of testing and in accordance with paragraph 3.3 of this Section.
 - d. Anchor Installation Records (Logs): Submit within 2 days of installation of individual anchors and in accordance with paragraph 3.3 of this Section.
 - e. Daily Inspection Logs: Submit in accordance with Paragraph 3.3 of this Section. Include within daily Activity Reports.

C. Closeout Submittals:

1. Within 7 days of receiving request from Owner to submit closeout submittals, unless otherwise agreed to by Owner, submit the following:
 - a. Anchor Records Summary: Submit copies of anchor installation and testing records to the Engineer, which shall include a summary of all laboratory test results, anchor test records, and anchor installation records.
 - b. Provide Record Drawings of installed rock anchors.

1.5 QUALITY ASSURANCE

A. Qualifications

1. The Contractor (or his/her rock anchor subcontractor) shall be a company specializing in rock anchor systems and shall have had a minimum of ten (10) years' experience with permanent rock anchors.
2. Drilling operators and foremen shall have a minimum of seven (7) years' experience installing permanent rock anchors with the Contractor's organization.
3. Retain the services of an independent testing laboratory experienced in the design of the grout mix and quality assurance and field control testing of grout materials.

B. Comply with all rules, regulations, laws, and ordinances of the State of Maine and of all other authorities having jurisdiction. All labor, materials, equipment, and services necessary to make work comply with such requirements shall be provided without additional cost to Owner.

C. Source Limitations: Obtain each type of product material of the same brand from the same manufacturer.

D. Certification of quality of materials to be used in the Work shall be furnished, in a form acceptable to the Engineer at the time of delivery of materials to the Site. Materials shall also be subject to on-site observations for conformance with specifications.

E. Quality Assurance Testing:

1. Verify each design grout mixture by laboratory trial batch, unless indicated otherwise. At a minimum, perform the following testing on each trial batch:
 - a. Unconfined compressive strength of 6 cubes in accordance with ASTM C109, Three cubed tested at seven (7) days and three cubed tested at twenty-eight (28) days of age.
2. Submit for each trial batch the following information:
 - a. Project identification name and number (if applicable).
 - b. Date of test report.
 - c. Complete identification of source of supply.
 - d. Brand, type, and quantity of each mixture.
 - e. Quantity of water used in trial batch.
 - f. Proportions of each material.
 - g. Unconfined compressive strength.

F. Requirements for laboratory trial batch may be waived by Engineer if sufficient field test data documenting compliance with specified material properties and performance properties is submitted to and accepted by

Engineer. Tests shall have been made on identical mix designs to each mix design proposed for the Work, including sources of aggregate and manufacturers of cementitious materials and admixtures.

1.6 LINE AND GRADE CONTROL

- A. Contractor shall be responsible for establishing and maintaining line and grade control for all aspects of the Work as shown on the Drawings and described in Section 02 21 00 - Surveys. All survey Work conducted on the project shall correspond to the Site coordinate system and vertical datum as shown on the Drawings.
- B. Tolerances for anchor locations and angles shall be as follows:
 - 1. Horizontal tolerance: to the nearest 0.1 feet.
 - 2. Vertical tolerance: to the nearest 0.1 feet

1.7 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered and handled with due care and all Work shall be protected in order to avoid damage or deterioration before, during, or after installation at the Site.
- B. Materials shall be handled and stored in a manner to prevent excessive bending stresses and damage. Store materials in orderly groups above grade. Block during storage to minimize possible distortion of members.
- C. Any member exhibiting variations beyond tolerance limits will be considered distorted and may not be used in the Work. Keep steel free from excessive rust. Any member product damaged or distorted as a result of the Contractor's operations shall be repaired or replaced, as directed by the Engineer at no additional cost to the Owner.
- D. The Contractor shall submit to Owner and Engineer storage procedures and requirements for all materials supplied by Contractor as part of this Contract.

1.8 PROJECT CONDITIONS

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section and cooperate with such trades to assure the steady progress of the Work.
- B. Visit the Site to review all details of the Work and working conditions and to verify dimensions in the field including headroom and interferences from adjacent structures and utilities. Notify Engineer in writing of any discrepancy before performing any Work.
- C. Maintain existing Site access as much as practical during Work. Restore Site access as necessary to provide adequate Site ingress/egress during construction.
- D. Contractor shall perform all Work in a manner causing the least possible obstruction to daily operations and shall protect all property from any unnecessary obstructions and any injury or loss attributable to the Contractor's operations. The Contractor shall repair, replace and/or compensate the applicable party for any such damage, injury or loss.
- E. Protect existing utilities to remain within the work area in accordance with the requirements of authorities having jurisdiction over same.
- F. Two (2) initial sacrificial test anchors shall be installed and tested within 45 days of proposed installation of production anchors. The anchor design shown on the Contract Drawings is contingent upon the performance test results of the initial sacrificial test anchors. Contractor may revise rock anchor design including rock anchor (quantity, size, and length), anchor assemblies or pertinent connections subsequent to initial anchor testing.

Any changes to the existing design shall be in accordance with agreed upon unit prices established in the Contract.

1.9 DESIGN AND PERFORMANCE CRITERIA OF PERMANENT ROCK ANCHORS:

- A. Rock anchors shall be designed to meet the specified loading as shown on Contract Drawing or specified herein. Anchor to pile cap connections shall be as specified in the Contract Drawings. The required geotechnical safety factors shall be in accordance with the Code and PTI, unless specified herein. Any proposed alternatives that do not meet the design and performance criteria will not be accepted. The calculations and drawings required from the Contractor shall be submitted to the Engineer for review and acceptance in accordance with this section.
- B. The overall length of the rock anchor shall be selected by the Contractor such that the required capacity is developed by skin friction between the grout and competent rock and meets the minimum bond length to satisfy pullout of the rock cone and as indicated in the Drawings.
- C. When required as shown on the contract drawings, corrosion protection of the anchor tendons shall be provided in accordance with this section and as follows:
 - 1. Mooring Dolphin Rock Anchors: PTI Class II Protection with epoxy coating
 - 2. Pier Rock Anchors: PTI Class I Protection with epoxy coating.

1.10 SCHEDULING AND COORDINATION

- A. Submit a detailed schedule, Work sequence, and methodology for all proposed Work.
- B. Schedule Work to perform installation during hours approved by the Owner and consistent with all agencies having jurisdiction.
- C. Do not install rock anchors until all underground and above ground utilities are properly supported, protected, and secured at a safe distance from any possible damage as a result of the Work.
- D. Coordinate with Owner and Engineer as to the relocation of any underground or above ground utilities prior to anchor installation.
- E. The Contractor shall provide a minimum of one fully equipped drill rig in full-time operation at the Site during the Work, and shall mobilize additional equipment, if necessary, to complete the work in accordance with the approved project schedule.

1.11 SUBSURFACE SOIL DATA

- A. Contractor shall be aware of all relevant Site conditions, including bathymetry, subsurface geology, existing bulkheads, groundwater elevations, and soil and groundwater environmental chemistry data. No request for additional compensation for differing Site conditions will be approved by Owner.
- B. The subsurface data are provided for general information. The Technical Data contained therein, upon which Contractor is entitled to rely, may be considered accurate only at the particular locations and times the subsurface explorations were made. It is Contractor's responsibility to make interpretations and to draw conclusions based on the character of materials to be encountered and the impact to his work based on his knowledge of the area and of earthwork techniques. The actual conditions between the explorations may vary. Other interpretations of the subsurface data referenced in the Specifications are possible. Neither the Owner nor the Engineer makes any representation or guarantee as to data accuracy, completeness or pertinence, and in addition, shall not be responsible for the conclusions to be drawn therefrom. The data are made available to the Contractor merely for the purpose of providing them with such information as is in the possession of the

Owner, whether or not such information may be accurate, complete or pertinent or of any value to the Contractor.

- C. Soil borings and other exploratory operations may be made by Contractor, at no additional cost to Owner. Coordinate Contractor-performed test borings and other exploratory operations with Owner, utility owners, other contractors, and others performing work for Owner as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of Owner, utility owners, other contractors, and others performing work for Owner. Comply with Laws and Regulations relative to required notifications.

PART 2 - PRODUCTS

2.1 ANCHOR TENDONS

- A. Anchor tendons shall be fabricated from the following as shown on the drawings:
 - 1. New, cold rolled, Type II, Grade 150 threaded bars conforming to ASTM A722.
- B. Anchor load shall be transferred to surrounding rock by "bond". Anchor tendons shall not be bonded in the zone above the rock length during anchor testing.
- C. Anchor tendons shall be epoxy coated and threaded meeting ASTM A775 or A934 with a minimum mil thickness of 8 mils.
- D. The maximum load applied to the tendon shall not exceed 80 percent of the yield stress. The Design load shall not exceed 60 percent of the yield stress.

2.2 ANCHOR ACCESSORIES

- A. All anchorage components shall develop 95% of the minimum guaranteed ultimate strength of the tendon and shall be compatible with the post-tensioning system.
- B. Plates, fasteners, bolts, nuts, washers, and spacers shall be provided in accordance with Section 05 05 23 - Miscellaneous Metals and Fastenings.
- C. Plastic Corrugated Tubing shall be high density polyethylene conforming to ASTM D3350 and D1248. Corrugated tubing shall be filled with factory applied grout.
- D. Smooth PVC Sleeve shall be schedule 40 PVC pipe conforming to ASTM D1785.
- E. Materials for sheathing accessories, such as spacers, grouting cap, coupler sheath and grout tube, shall be mechanically and chemically equivalent to the plastic sheathing.
- F. Grease for pumping into grease sleeve assembly shall be a mastic corrosion inhibitor, waterproof, non-corrosive, non-hardening sealing compound such as DOW Corning Silicone Sealing Compound No. 4, or Visconorust PT-1 produced by Viscosity Oil Company, or equivalent acceptable by the Engineer.
- G. Grout tubes shall have an adequate inside diameter to enable the grout to be pumped to the bottom of the drill hole. Grout tubes shall be strong enough to withstand a minimum grout pressure of 145 psi. If required, post-secondary grout tubes shall be strong enough to withstand post grouting pressures. Second post grout tubes shall be equipped with check valves spaced at 4 centers within the bond zone.

2.3 GROUT

- A. Grout shall be neat cement, a mixture of Portland Cement Type II or III and water only. Cement shall have a minimum fineness as in high early strength cements of at least 4,500 cm (cm)/gm as measured by the Blaine

method. An approved additive may be mixed with the grout as an expanding agent, only for secondary grouting and filling voids, trumpets and anchorage covers as required. Admixtures which control bleed and retard set may be used. Additives shall be mixed and placed in accordance with manufacturer's recommendations. Admixtures shall contain no substance which is deleterious to the tendon. The grout shall have a compressive strength of at least 5,000 psi at twenty-eight (28) days in accordance with ASTM C109.

- B. Proportions of grout materials shall be based on tests made on the grout before grouting has begun. The water content shall be the minimum necessary for proper placement and shall not exceed a water-cement ratio of 0.45 (approximately 5 gallons of water per sack of cement).
- C. Grout shall pass through a screen with 0.07-inch maximum clear openings prior to being pumped into the grout pump.
- D. Water used in grout shall be fresh, clean, and potable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Requirements

- 1. Machines, tools, and other equipment used in performance of the Work shall be maintained in a satisfactory working condition at all times and shall not damage the anchor tendons or the anchorages.
- 2. The Engineer reserves the right to order the discontinuance of the use of any equipment which, in the opinion of the Engineer, fails to produce satisfactory work.

B. Drilling Equipment

- 1. The grouting holes for rock installation shall be drilled with equipment adequate to obtain the required alignment and plane throughout the full length/depth of the hole.
- 2. The equipment shall be capable of accomplishing the drilling without undermining or causing subsidence of the ground or facilities above the drilled hole. Drill tooling shall be capable of penetrating existing subsurface conditions and concrete plugs. Drilling equipment may be rotary, auger, percussion, or roto-sonic utilizing either (1) closed-end casing with expendable tip or (2) open-end casing, provided wash fluid and cuttings return through the inside of the casing. Equipment shall be capable of installing the rock anchors to the specified angles and within the tolerances presented herein.

C. Grouting Equipment

- 1. The grouting equipment shall be capable of continuous mechanical mixing to produce a grout free of lumps and undispersed cement. A manifold system shall permit continuous circulation and pumping of grout with accurate control of grout pressure.
- 2. The equipment shall be maintained in first-class operating condition, and any grout hole that is lost or damaged due to mechanical failure of the grouting equipment or grout supply shall be re-drilled and re-grouted by the Contractor at no additional cost to the Owner.
- 3. The grouting equipment to be furnished shall include the following as a minimum:
 - a. Positive displacement pump: The drive between the pump motor and the pump shall be positive with no slippage. Pump shall be equipped with accurate pressure gauges mounted in clear view of the equipment operator.
 - b. Heating equipment to prevent grout from freezing.

- c. Such piping, valves, pressure gauges, pressure hose, small tools and accessories as may be necessary to provide a continuous supply of grout and accurate pressure control. The inside diameter of the delivery lines shall be such that objectionable settlement of solid matter will not take place when pumping at the minimum discharge capacity of the pump. Accurately calibrated high precision pressure gauges shall be used for periodic checking of the accuracy of all gauges used in the grouting.
- d. Compressor of suitable capacity, water pump and other auxiliary equipment shall be provided as required.

D. Test Equipment and Instrumentation

1. Stressing equipment shall consist of center-hole hydraulic jacks capable of applying not less than the specified test load (i.e., 1.33 times the specified design load) to the anchor tendon.
2. Hydraulic jacks shall be equipped with calibrated hydraulic pressure gauges capable of reading to an accuracy of one kip to permit the stress in the tendon to be computed at any time. A recent (within one month) calibration chart shall accompany each jack-pump-gauge unit. If inconsistencies between the measured elongation and the jack gauge reading occur, the jack and gauge shall be recalibrated. An agreement of within 3 percent shall be satisfactory. Hydraulic pressures on the jack shall be maintained so as to maintain a constant load.
3. Load cells may be utilized to indicate the load applied.
4. The Contractor shall provide all test equipment and instrumentation as necessary to assure proper installation and performance/proof/lift-off testing of all rock anchors.
5. Displacement measurement devices shall be accurate to at least 0.001 in.
6. A minimum of four strain gauges (2) two at the top, (2) in the middle, and (2) two at the bottom of each performance test anchor shall be installed. Contractor shall coordinate with the Engineer (Owners Representative) at the time of installation for locations.

E. Drill Holes

1. Drilling equipment shall be suitable for the soil and anticipated subsurface. Subsidence or physical damage to existing facilities shall be cause for immediate stopping of drilling, which shall not be resumed until procedures are revised to prevent damage. Equipment shall be capable of installing the rock anchors to the specified angles and within the tolerances presented on the Drawings.
2. The diameter of the hole shall be a minimum of the sizes shown on the Drawings and be suitable for the sub-surface conditions, installation procedure and tendon type selected.
3. A template, spacers, or other approved method shall be used by the Contractor to keep the horizontal and vertical alignment of the drill holes.
4. The length of the drilled hole and the elevation of the bottom of the hole shall be checked prior to start of grouting. The hole shall be drilled and cleaned out to twelve (12) inches beyond the end of the anchor tendon.
5. Before installation of the anchor tendon, each hole shall be cleaned thoroughly of all debris, concrete plug cuttings and loosened soil by an approved method.

F. Installation and Grouting of Anchors

1. Anchor tendons shall be placed, centralized and secured into drilled holes in accordance with the manufacturer's recommendations and reviewed shop drawings. Care shall be taken that in the bonded length (zone) the anchor tendon is centered in the hole.
2. Drilling of anchors adjacent to anchors grouted within a 24-hour period are prohibited to avoid communication between the piles.

3. Grouting operations shall be in accordance with PCI Recommended Practice and the manufacturer's recommendations.
4. Suitable devices shall be provided to maintain tendon alignment until grout is set.
5. Upon completion and approval of the drilled hole, the anchor assembly shall be placed into drilled hole with a grout pipe attached, and then the hole is grouted. Upon removal of steel casing, Contractor shall extract the casing to the top of the bond zone and the bond zone shall be globally pressurized to a minimum 50 psi, unless Contractors means and methods are demonstrated through performance testing and accepted by Engineer. Grout pressure at any given depth shall not cause a blow-up of the soil overburden.
6. If necessary, Contractor shall perform post-secondary grouting within 18 to 24 hours of initial grout placement. At the time of post-secondary grouting, Contractor shall be capable of demonstrating grout tube valves have opened using a pressure gage.
7. After completion of grouting of the hole, the tendon shall be held in position until the specified grout strength has been obtained. As part of the final installation of the stressing head, the exposed tendon end shall be kept clean, dry, and free from corrosion.
8. Precautions shall be taken to prevent freezing of the grout when the temperature is 35 degrees or below.
9. No hole shall be left partially completed overnight but shall be completely grouted and protected at the termination of each day's operation.

G. Obstructions

1. Where obstructions make it difficult to install certain anchors at locations shown on the Drawings and/or to the proper depths, the Contractor shall employ tooling to penetrate the obstruction at no additional cost to owner. Anchors shall be installed within the tolerances of the angles presented on the drawings.

3.2 TESTING AND TOLERANCES

A. Design Load

1. Each rock anchor shall provide a minimum design working load specified herein.

B. Stressing and Testing

1. The following testing shall be performed:
 - a. Sacrificial Test Anchors: Two (2) initial sacrificial test anchors shall be installed and tested prior to installation and ordering of production anchors. Sacrificial test anchors shall be installed on land at locations specified by Engineer and in accordance with the Performance test schedule outlined herein.
 - b. Performance Test Anchors: Performance tests (described herein) shall be performed at the following locations:
 - 1) Mooring Dolphin Rock Anchors: One (1) performance test per dolphin for a total of Three (3) performance tests.
 - 2) Pier Rock Anchors: Three (3) performance tests equally spaced along the length of the pier (pier ends and center). Performance test anchors may be used as production anchors if they meet the requirements of these specifications after testing.
 - 3) Locations of the test anchors shall be selected by Contractor, subject to Engineer and Owner acceptance.

- c. Proof Test Anchors: All anchors, except for production and sacrificial performance test anchors, shall be proof tested as described herein.
2. Stressing and testing shall be performed generally in accordance with PTI "Recommendations for Prestressed Rock and Soil Anchors", latest edition, and ASTM D1143, as specified herein. Stressing of anchors shall not take place until the grout has acquired sufficient strength to preclude bond failure during stressing and testing.
3. The Contractor shall supply all necessary equipment, material, and labor to stress and test the installed anchors. Such equipment shall include, but not be limited to, calibrated jacks, dial gages, load cells, strain gages, and adequate reaction frame to safely resist the maximum test load. Care must be taken to maintain a constant jack load.
4. Do not begin load tests until grout reaches the required design compressive strength in accordance with ASTM C109/C109M. Allow a minimum of 3 days for the grout to cure.
5. Provide sufficient protection from the elements (rain, wind, etc.) and heating during the load tests, as required, which could affect the test results.
6. Performance Test
 - a. Performance test anchors shall be initially installed and tested as specified herein. Should the anchor fail the performance test, the Contractor and Engineer shall review the tendon dimensions and installation procedures and modify the rock anchor design to achieve the load test requirements specified herein. Revised anchor tendon dimensions or installation procedures shall be submitted to Engineer for review.
 - b. The test anchors shall be constructed from the same materials and in the same manner as the production anchors.
 - c. The performance test shall be conducted by cyclically and incrementally loading and unloading the anchor as follows:
 - AL
 - AL, 0.25 DL
 - AL, 0.25 DL, 0.5 DL
 - AL, 0.25 DL, 0.5 DL, 0.75 DL
 - AL, 0.25 DL, 0.5 DL, 0.75 DL, 1.0 DL
 - AL, 0.25 DL, 0.5 DL, 0.75 DL, 1.0 DL, 1.2 DL
 - AL, 0.25 DL, 0.5 DL, 0.75 DL, 1.0 DL, 1.2 DL, 1.33DLDL = Design Working Load
AL = Load Necessary to maintain alignment of stressing and testing equipment
 - d. Hold 1.33 DL for creep test. Record movements using a dial indicator capable of reading increments of 0.001 in. Record readings at 0, 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between 1 and 10 minutes exceeds 0.040 in., the test shall be maintained for an additional 50 minutes. Total movements shall be recorded at 20, 30, 40, 50, and 60 minutes. Release to transfer load and lock off anchor nut.
 - e. During the hold periods, the anchor load shall not be allowed to deviate from the Test Pressure by more than 50 psi. Re-pumping back to Test Load will compensate for small movements, hydraulic oil seepage, and changes in temperature of the hydraulic oil. The load shall always be returned to the specified Test Load prior to taking the movement reading at the specified interval. The Test Load shall not be exceeded during the period of observation. For the Performance Test, observed load vs. extension shall be plotted.

- f. Some initial movement of the anchor, until resistance in the surrounding soil is fully mobilized, is anticipated. Such movements due to seating shall not be considered in applying the acceptability criteria.
 - g. Acceptability Criterion:
 - 1) The Engineer shall evaluate the test data and determine whether the anchor is acceptable. Two groups of acceptance criteria shall be satisfied: Creep and Movement.
 - i. Creep: The creep amount shall not exceed 0.04 inches at Test Load (TL) during the period of 1 to 10 minutes. If this value is exceeded, then the total creep movement in the period of 6 to 60 minutes shall not exceed 0.08 inches.
 - ii. Movement: The minimum apparent free length at the Test Load, as calculated on the basis of elastic movement, shall be equivalent to not less than 80% of the designed free tendon length plus the jack length. If this criterion is not met, the anchor shall be reloaded up to two times more from AL to TL and the calculation repeated on these cycles. If the criterion is still not met, then a) the cause of this inefficiency in load transfer shall be investigated and b) the anchor may be rejected or de-rated. The maximum apparent free length at the Test Load, as calculated on the basis of elastic movement, shall be less than 100% free length, plus 50% bond length plus the jack length.
 - 2) Test anchors having met the acceptability criteria may be used as production anchors after anchors. Contractor shall remove all slack and tension anchor nut with hand equipment to Engineers recommendations.
7. Proof Test
- a. The proof test shall be performed on all production anchors, other than the sacrificial and performance test anchors, by incrementally loading the anchor in accordance with the sequence listed below. At each increment, the movement of the end of the anchor shall be recorded with a micrometer dial reading to 0.001 inch. At the Test Load, the load shall be maintained constant for 10 minutes and total movement readings shall be recorded at 1, 2, 3, 4, 5, 6, and 10 minutes.
 - b. The proof test shall be conducted by cyclically and incrementally loading and unloading the anchor as follows:
 - 0, AL, 0.25 DL, 0.5 DL, 0.75 DL, 1.0 DL, 1.20 DL, 1.33 DL (Test Load).

DL = Design Working Load

AL= Load necessary to maintain alignment of stressing and testing equipment
 - c. If the total creep movement between 1 and 10 minutes exceeds 0.04 inches, the Test Load shall be maintained for an additional 50 minutes and the movement readings shall be recorded at 20, 30, 40, 50, and 60 minutes.
 - d. Acceptability Criterion: Acceptability criterion specified for Performance Test Anchors outlined herein shall be applicable for production anchors, too.
8. Other Acceptance Requirements
- a. All testing shall be performed in the presence of the Engineer.
 - b. Additional tests shall be performed when any changes are made in the anchor assembly or installation procedures at no additional cost to the Owner.
 - c. Non-conforming anchors include anchors that are installed out of the tolerances specified, are damaged, had a volume of grout placed that is less than the theoretical volume of the hole, have grout tests that do not indicate the specified grout strength has been achieved,

and do not have sufficient length in the bond zones. To mitigate and/or remedy non-conforming anchors, the Contractor may be required to provide additional anchors or supplement anchors to meet specified requirements at no additional cost to the Owner.

3.3 FIELD QUALITY CONTROL

- A. Quality control testing in the field during construction shall be provided by Contractor. The Contractor shall keep installation records and produce installation records at the completion of the Work as specified herein. The Engineer or Owner may keep their own installation records. This will not in any way relieve the Contractor from their responsibility to keep installation records as specified herein.
- B. During the course of the Work, maintain a complete record of rock anchor installation, and at completion of pile work submit the rock anchor records.
 - 1. Anchor Test Records:
 - a. Sacrificial, Performance and Proof Testing in accordance with the requirements specified herein.
 - 1) Contractor shall submit tabulated data and plotted test results of performance and proof testing to Engineer within 24 hours after completion of test. At a minimum each test report shall demonstrate if the anchor acceptability criteria established has been satisfied.
 - 2) No anchor testing shall be completed except in the presence of an authorized representative of the Engineer.
 - 2. Grout Cube Laboratory Testing:
 - a. Retain the services of an independent testing laboratory to collect and test grout cubes.
 - b. Molding, storage, and test procedures shall be in accordance with ASTM C1107 and ASTM C109 except that cube expansion will be restrained after making and during storage by a weighted base plate as a cover. Six cubes shall be made to test each days grouting operation. Three cubes shall be tested at seven (7) days and three cubes tested at twenty-eight (28) days of age.
 - 3. Anchor Installation records:
 - a. Contractor shall prepare logs for each individual anchor. At a minimum each log shall include the following:
 - 1) Project name and number and Name of Contractor
 - 2) Rock location and number
 - 3) Anchor dimensions: drilling diameter, casing diameter and length, bond length, stressing length.
 - 4) Anchor end elevation and grade elevation
 - 5) Anchor re-installation, if performed
 - 6) Date, time, total depth of penetration, and rate of penetration
 - 7) Any unusual phenomena encountered in instillation of rocks
 - 8) Variations from specified tolerances, including surveyed location, slope and skew (angle from horizontal and vertical).
 - 9) Grouting records indicating the cement type, quantity injected, grout pressure, and position(s) of casing during grouting.
- C. Site inspections shall be performed by the Contractor:

1. Perform daily or more frequent inspections of all rock anchor work to ensure work is being performed in accordance with applicable Laws and Regulations.
2. Any unusual conditions encountered during rock anchor installation shall be reported immediately to the Engineer.
3. Document the date, time, and outcome of each inspection in a dedicated log. Submit a copy of the inspection log to the Engineer.

3.4 PROTECTION OF WATER RESOURCES

- A. The Contractor shall not discharge fuel oil, sewage, septic water or other deleterious substances into the Castine Harbor or drainage facilities.
- B. Contractor shall be responsible for containment, collection, and disposal of all drill spoils in accordance with Contract Documents and permits.
- C. The Contractor shall contain and collect all floating debris that results from the project. Floating debris and solid trash shall be collected and disposed of in accordance with Contract Documents.

END OF SECTION

SECTION 35 59 13.02

TIMBER REPLACEMENT AND TIMBER FENDER SYSTEM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 00 and DIVISION 01 which are hereby made a part of this Section of the Specifications. Examine all other Sections of the Specifications for requirements which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- B. Coordinate Work with that of all other trades or contracts affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under the Contract.

1.2 DESCRIPTION OF WORK

- A. Contractor shall furnish all labor, equipment, materials, tools, supervision, and transportation necessary to perform all operations necessary to furnish and install all items consistent with this Section and as shown on the Drawings. These items include, but are not limited to, the following:
 - 1. In-kind timber replacement: Work includes, but is not limited to, replacement of timber fenders and closure pieces at the Travel Lift piers, as shown on the Drawings.
 - 2. New timber fender system: Work includes, but is not limited to, installation of fender piles, wales, and chocks for the proposed timber fender system, as shown on the Drawings.

1.3 REFERENCES

The latest edition of the following:

ASTM INTERNATIONAL (ASTM)

- ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM D25 Standard Specification for Round Timber Piles

INTERNATIONAL BUILDING CODE (IBC)

MAINE UNIFORM BUILDING AND ENERGY CODE (MUBEC)

AMERICAN WOOD COUNCIL

National Design Specifications for Wood Construction

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

- AWPA M4 Standard for the Care of Preservative-Treated Wood Products
- AWPA P5 Standard for Waterborne Preservatives
- AWPA P23 Standard for Chromated Copper Arsenate Type C (CCA-C)
- AWPA P34 Standard for Copper Naphthenate, Waterborne
- AWPA T1 Processing and Treatment Standard
- AWPA U1 User Specification for Treated Wood

TIMBER REPLACEMENT AND TIMBER FENDER SYSTEM

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit manufacturer's data and certifications to Engineer not less than 21 days prior to start of Work.
 - a. Certificates conforming the timber species, grade, size and preservative treatment meet or exceed the project requirements.
 - b. New CCA-treated Southern Yellow Pine timber elements: Contractor shall submit to Engineer for review duplicate copies of licensed independent testing laboratory certification that the timbers were free from defects, were properly peeled, seasoned, and otherwise prepared for the intended use.
 - c. Product data for field applied preservative treatment.

B. Informational Submittals:

1. At least 4 weeks prior to material delivery Contractor shall submit certificates from the treatment plant or a qualified testing laboratory and/or lumber supplier attesting that:
 - a. All timber is free from decay.
 - b. All timber has been treated in conformance with these Specifications.
 - c. All timber is of the grade and quality specified herein.
2. Fender System Work Plan: Not less than 21 days prior to fender system installation, Contractor shall submit a Fender System Work Plan including a description of installation equipment and procedures.

C. Closeout Submittals:

1. Within 2 days of installation of individual timber piles, submit Timber Pile Installation Records (logs) as defined herein to the Engineer.
2. Within 7 days of receiving request from Owner to submit closeout submittals, unless otherwise agreed to by Owner, submit the following:
 - a. Provide Record Drawings of installed timber in accordance with Section 02 21 00 – Surveys and the appropriate sections of Division 00 and Division 01.

1.5 QUALITY ASSURANCE

- A. Contractor providing this Work shall submit evidence of suitable experience in this type of work and of the competence and experience of the person in charge at the site. Approval of Contractor's experience shall be solely based on the judgement of the Engineer. Granting approval by Engineer shall in no way imply acceptance of responsibility by Engineer for Contractor's ability to perform the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All structural timber stored on site shall be carefully stored so as to prevent damage or deterioration of the material and its protective treatment.
- B. Stack lumber and timber off the ground on skids and under cover in a manner that prevents warping and allows shedding of water. Handle timber with rope or chain slings without dropping, breaking outer fibers, bruising, or penetrating the surface with tools. Do not use cant dogs, peaveys, hooks, or pike poles. Protect timber and hardware from damage.

- C. Contractor shall store and handle timber piles to avoid damaging the piles. Piles shall be stacked during delivery and storage so that each of the piles is maintained in a straight position. Piles shall not be stacked more than 5 feet high.
- D. Piles shall not be dragged across the ground. Contractor shall inspect piles for damage before transporting from the storage area to the driving area and immediately prior to driving. Bent piles shall be rejected.
- E. Contractor shall be responsible for all damage to piles until Final Acceptance, except as specified otherwise in this Specification.
- F. Contractor shall protect piles during handling and installation.
- G. Inspection and review of piles at the place of manufacture shall not be construed as acceptance.

1.7 LINE AND GRADE CONTROL

- A. Contractor shall be responsible for establishing and maintaining line and grade control for all aspects of the Work and as specified on the Drawings and described in Section 02 21 00 – Surveys. All survey work conducted on the project shall correspond to the Site coordinate system and vertical datum as shown on the Drawings.
- B. Final locations of timber wales, chocks, and fender piles shall be within the following tolerances:
 - 1. Horizontal tolerance: 0.05 feet
 - 2. Vertical tolerance: 0.05 feet

1.8 SCHEDULING AND COORDINATION

- A. Submit a detailed schedule, Work sequence, and methodology for all proposed work.
- B. Schedule work to perform installation during hours as approved by the Owner and consistent with all agencies having jurisdiction.

PART 2 - PRODUCTS

2.1 TREATED STRUCTURAL TIMBER AND LUMBER

- A. Timber
 - 1. Timber shall be of the nominal dimensions shown on the Drawings.
 - 2. Timber shall be Number 1 grade or better, southern yellow pine as rated by the Southern Yellow Pine Inspection Bureau.
 - 3. All timber shall be free from defects, which will materially impair strength and durability of timber members.
- B. Preservative Treatment
 - 1. All timber shall receive a preservative treatment of Chromated Copper Arsenate (CCA) waterborne preservative system. Minimum retention shall be 1.5 pounds per cubic foot.
 - 2. Treatment shall comply with the AWPA Standard U1: User Specification for Treated Wood, latest edition. Service Condition shall be UC5A – Marine Use in Northern Waters. The material shall be applied in accordance with AWPA Standard T1: Processing and Treatment Standard, latest edition.

2.2 ACCESSORIES

A. Fastenings

1. All fastenings and related hardware shall conform to the requirements of Section 05 05 23 – Miscellaneous Metals and Fastenings.

2.3 TIMBER PILES

A. Timber piles shall conform to the following requirements:

1. Be cut from sound, live trees of Southern Yellow Pine ~~– 12-inch-14-inch~~ Class A piles in accordance with ASTM D25.
2. Be free from defects, which will materially impair strength and durability of piles such as shakes and clusters of knots.
3. The axis of each pile shall not deviate from a straight line more than 1 inch in 10 feet.
4. Be cut square with its axis at both ends.
5. Exhibit substantially uniform taper from tip to butt.
6. Be peeled and properly seasoned to prepare them for use.
7. New piles are to be CCA treated in accordance with AWPA U1, AWPA T1, and AWPA P23. Minimum retention shall be 1.5 pounds per cubic foot.

B. Piles must be one piece. Splices shall not be permitted.

C. Unsatisfactory piles shall be removed from the Site by Contractor at no expense to Owner.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Timber Piles

1. Install all piles as shown on Drawings.
2. All piles shall be driven to refusal or to the tip elevation shown on the Drawings.
3. Contractor shall be responsible for correctly locating new piles to be installed. Piles shall be installed within 2 inches of the design location. Piles not driven within these limits will not be eligible for payment. Piles may not be pulled into position.
4. Piles shall be cut after installation to the cut-off elevation indicated on the Drawings. Provide a smooth level cut.
5. Piles shall be installed using a vibratory hammer or impact hammer of sufficient capacity to achieve tip elevations as shown on the Drawings.
6. Contractor shall verify existing conditions and protect all structures, underground and above ground utilities before starting Work. Use driving methods which will not cause damage to the same.
7. The Contractor shall schedule the pile installation sequence so that no piling shall be driven within 50 feet of concrete less than 7 days old, unless otherwise accepted by the Engineer.
8. Each pile shall be driven continuously and without voluntary interruption.
9. Jetting of piles is not permitted.

10. A “slow start” technique shall be utilized during installation of piles to ensure that any mobile marine species in the project impact area have time to move away from the noise source and reduce the likelihood of exposing the marine animals to sound levels that cause injury. The “slow start” technique shall be employed at the beginning of each pile-driving session and when hammering ceases for more than 30 minutes. The following shall be employed for each hammer type:
 - a. For vibratory hammers, the pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15-seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
 - b. For impact hammers, there will be an initial set of three strikes at 40 percent energy, followed by a one-minute waiting period. This sequence of three strikes at reduced energy, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.

B. Timber and Lumber

1. Timber shall be of the nominal dimensions, accurately set in place, and rigidly secured as shown on the Drawings.
2. Holes for fastenings shall be bored straight and true. Holes for bolts shall be neat size. Lead holes for lag screws shall be equal to the shank diameter for the shank portion of the lag and equal to approximately 70% ±5% of the shank diameter for the length of the threaded section.
3. Bolt heads and nuts in contact with wood using dock washers as indicated on Drawings. Burr threads of all bolts after nuts have been finally tightened. Vertical bolts shall have nuts on the lower end. Where bolts are used to fasten timber to timber, timber to concrete, or timber to steel, bolt members together when they are installed and retighten immediately. Bolts shall have additional threading to provide at least 3/8 inch per foot thickness of timber for future re-tightening.
4. Cut and frame all timber so that joints will have fit over contact surface. Unless indicated, no shimming will be permitted in making joints. Open joints are unacceptable. Bore holes with bolts with a bit 1/16 inch larger in diameter than the bolt. Bore holes for lagging screws in two parts. Lead holes for the shank shall have the same diameter equal to approximately two-thirds of the shank diameter. Counter bore for counter sinking wherever smooth faces are indicated or specified.
5. All existing timbers that are required to be removed to replace deteriorated members shall be removed and reinstalled by Contractor and considered incidental to the Work.

3.2 TEMPORARY SUPPORT

- A. Contractor shall be responsible to provide any temporary support or shoring required during construction.

3.3 FIELD TREATMENT

- A. Timber piles shall receive field treatment for all cuts, bevels, notches, refacings, and abrasions according to AWP4 M4. Trim cuts and abrasions before treating. Paint depressions and openings around bolt holes, joints, and gaps including recesses formed by counterboring, with the same preservative used in the pressure treatment. After bolt or screw is in place, fill depression with hot pitch or bitumastic compound.

3.4 REJECTED PILES

A. Obstructions:

1. Where obstructions interfere with driving piles at the locations, shown on the drawings, Contractor shall resort to all usual methods to install piles as required, including pre-augering, spudding, and excavation.

If these methods prove unsuccessful, piles shall be drilled to achieve required penetration at the design locations.

2. Contractor shall notify Engineer immediately in writing if an obstruction is encountered. Piles abandoned because of obstructions shall be cut off or pulled out at the discretion of Engineer.

B. Broken Piles:

1. At no cost to Owner, piles broken above the ground surface or within 5 feet of the ground surface shall be cut off or removed and replaced at the discretion of Engineer.
2. Piles with suspected breakage based on driving logs, but which cannot be verified because of depth, may be rejected at the discretion of Engineer.

C. Defective Piles:

1. Defective piles shall be replaced by extracting the defective pile and driving additional piles, as Engineer may approve. Such replacement or addition shall be solely at the expense of Contractor and without compensation.
2. A pile exhibiting any one of the following conditions shall be deemed a defective pile:
 - a. Piles exceeding the placement tolerance, unless otherwise specifically accepted by Engineer. Piles exceeding the location tolerance shall be removed and re-driven, as directed by Engineer. Additional piles shall be provided at no cost to Owner.
 - b. Any pile, which shows signs of being broken, split, or otherwise damaged during driving, including damage to the pile tip.
 - c. Any pile damaged during transport, storage, handling and/or driving, which then cannot be properly installed.

3.5 FIELD QUALITY CONTROL

- A. Quality control testing in the field during construction will be provided by Contractor. The Contractor shall keep installation records and produce installation records at the completion of the Work as specified herein. The Engineer or Owner may keep their own installation records. This will not in any way relieve the Contractor from their responsibility to keep installation records as specified herein.
- B. During the course of the Work (pre-clearing and timber pile installation), maintain a complete record of obstructions and debris recovered within the project area and upland areas.
- C. During the course of the Work, maintain a complete record of timber pile installation, and at completion of pile installation, submit pile installation records to the Owner and Engineer, which shall include the following data for each pile:
 1. Project name and number and Name of Contractor
 2. Pile location and number
 3. Type of pile driving cap block or hammer cushion used, if any
 4. Hammer specification and rate of operation of pile driving equipment
 5. Pile type and size
 6. Elevation of pile tip
 7. Elevation of pile butt before and after cut-off
 8. Mudline elevation

9. Pile uplift and re-driving, if performed
 10. Date, time, total depth of penetration, rate of penetration per foot and per inch for the last 12 inches (if vibratory hammer is used), number of blows for every foot of penetration and number of blows for the last 12 inches of penetration (if impact hammer is used)
 11. Variations in plumbness
 12. Any unusual phenomena encountered in driving piles.
- D. Provide Record Drawings of installed pile locations in accordance with Section 02 21 00 – Surveys.
- E. Inspection and Monitoring
1. Protect all structures, equipment, underground and above ground utilities from damage during pile driving operations.
 2. Contractor is responsible for any and all damages to existing structures and utilities as a result of pile installation operation.
 3. Contractor shall coordinate with the Owner and other agencies to locate existing utilities in the Work Area and shall report conflicts to the Owner.
 4. Repairs of damage to existing structures and utilities resulting from the Work shall be performed at the expense of the Contractor, at no cost to the Owner.

END OF SECTION