ADDENDUM 1

DATE: 04/05/2019

TO: Prospective Bidders

FROM: Facilities Management
5765 Service Building
Orono ME 04469-5765
207-581-2638

RE: ADDENDUM 1 to Bid Documents and Specifications for:
FLOWING SEAWATER LABORATORY RENOVATION & INFRASTRUCTURE UPGRADES
(EDA Award Number: 01-01-14765 DMC)
University of Maine; Orono, Maine

This Addendum forms a part of the Contract Documents and modifies the original Bid Documents and Specifications dated March 9, 2019. Portions of the bid and contract documents not altered by this Addendum remain in full force.

Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

This Addendum consists of the following:

SPECIFICATIONS

Section 00 01 10 Table of Contents
DELETE Section in its entirety.
REPLACE with the attached Section 00 01 10

Section 00 41 13 Bid Form
DELETE Section in its entirety.
REPLACE with the attached Section 00 41 13.

Section 01 23 00 Alternates
DELETE Section in its entirety.
REPLACE with the attached Section 01 23 00.

Section 07 42 23 – FIBER REINFORCED CEMENTITIOUS SIDING
REVISE Section 1.1.A.1 Fiber cement siding – factory-primed, factory finished.
REVISE Section 2.1.B.3. Finish to be Statement color, Color or equivalent.

Section 08 16 13 – FIBERGLASS REINFORCED PLASTIC DOORS
REVISE Section 1.1.B.2 – Refer to Hardware on A1.0A
DELETE Section 2.1.D.2.

Section 08 36 13 – SECTIONAL DOORS
DELETE Section 1.1.B.3
Section 09 29 00 – GYPSUM BOARD

**INSERT** Section 2.2.A.1. Basis-of-Design Manufacturer: USG Fiberock Brand/ Aqua-Tough AR Interior Panel, Gold Bond® eXP® Interior Extreme® AR Gypsum Panel, or approved equal. – Level 5 finish – or Architect acceptable equivalent.

**REVISE** Section 3.6.B

B. Apply gypsum board finish in accordance with manufacturer's published instructions and GA-214 Finish Levels. Provide Level 5 finish, except as follows:

1. Level 0: Not Used.
2. Level 1: Not Used.
3. Level 2: Not Used.
4. Level 3: Not Used
5. Level 4: Not Used.
6. Level 5: Open Lab and Isolation Labs

Section 09 91 00 – PAINTING

**DELETE** Section in its entirety.

**REPLACE** with the attached Section 09 91 00.

Section 12 35 53.23 – Solid-Plastic Laboratory Casework

**ADD** to section 2.1.A.1 – e. Chemical Systems Services, Inc.; 508-431-9995MA

**DELETE** Section 2.2.A.1.

Section 26 05 10, subsection 1.23 Alternates:

**DELETE** Section 1.23.C.

**REPLACE** Section 1.23.C.

C. Schedule of Alternates

1. Deduct/Alternate #1:
   
   a. Deduct the cost to install two (2) Hayward Bag Filter Systems depicted on DWGs SW-07, SW-08, SW-12, SW-13, and SW-16 and described in specification section 350580 section 2C. This shall include the six (6) Hayward Bag Filters Model # FLV4P2S20T4VS and all of the associated 4” Sch 80 PVC Piping, Valves and fittings. In lieu of the Hayward Bag Filter Systems consisting of three (3) Bag Filters each, provide instead the installation of a single (OFCI) Hayward Bag Filter Model # FLV4P2S20T4VS and 2” Sch 80 PVC Piping and 2” Spears PVC Ball Valves ON EACH Seawater Line A and B for a total of two (2) Hayward Bag Filters to provide some seawater filtration capabilities.

2. Deduct/Alternate #2:
   
   b. Deduct the cost to install the entire Seawater Heating System depicted on DWGS SW-10, SW-11, SW-12, SW-16, SW-17 and SW-18 and described in specification section 350580 Section 2.1 and 350830. This shall include the two (2) (CFCl) Zodiac Heat Line Heat Exchangers Model # 70 and all of the associated PVC and Copper Piping, valves and fittings, the Belimo Control Valve and the Heating Temperature Control Equipment and installation as described on Drawing SW-17 as well as the entire Seawater Degassing System as depicted on DWGs SW-08, SW-10, SW-12, SW-15, SW-17 and SW-18. which shall include the one (1) (OFCI) CSSI Degasser Model # SWCD-PVC-50-100T, the two (2) Hayward Pro Max Pumps, the two (2) Plast-O-Matic PVC Control valves and all of its associated PVC piping, valves, sensors and controls. In lieu of the Zodiac and CSSI Degassing Seawater Heating System the Owner will furnish one (1) 4 KW Aqualogic In-Line Titanium Electric Heater with Temperature Controller Model #TIL5 Electric shall be 230 Volt 1 Phase. No Contractor installation required.

3. Deduct/Alternate #3:
c. Deduct the cost to install one (1) (OFCI) 10 ton Aqualogic Heat Pump Model #HP-7 230 volt 3 phase depicted on DWGS SW-10, SW-11, SW-12, SW-16 and SW-18 and described in specification section 350580 section 2.3. Also delete the single phase to three phase digital inverter. Provide the cost reduction value which shall include the installation of the Aqualogic Heat Pump #HP-7 and all of its associated PVC piping, valves, fittings, housekeeping pad and electrical service and in lieu of the Aqualogic Heat Pump Model HP-7 the Owner will provide one (1) ½ hp Aqua Logic Cyclone Chiller Model #CY-5 with Temperature Controller and submersible Titanium Helix Refrigerant Wand for individual tank cooling capability. Electric shall be 110V 1 phase 60 HZ. No Contractor installation required.

4. Deduct/Alternate #4:

d. Delete new 800 amp service, including MDP, service feeder, utility connection, transformer installation, service grounding and feeders. Install new 200 amp service breaker connected from transformer secondary conductors to serve new pump house panel, including wiring.

Section 26 05 30 Wiring Methods, subsection 1.2 Description of Work:

**INSERT:** A. 1.2.14 – High Voltage Cable and A. 1.2.15 – High Voltage Cable Connections and Splices

Section 26 05 30 Wiring Methods, subsection Part 2 – Products:

**INSERT:** 2.11 CONDUCTORS – MEDIUM VOLTAGE

A. General

1. The medium voltage cable shall be single conductor, ethylene-propylene rubber (EPR) insulated, shielded and jacketed power cable with fully rated concentric neutral for medium voltage applications, and shall be in accordance with NEC Article 328. Cables shall be UL listed and designated as MV-105.

2. The cable shall be in compliance with the latest applicable edition of the following Industry Standards:

   a. AEIC CS-8
   b. ICEA S-93-639/NEMA WC-74
   c. UL 1072
   d. NFPA 70

3. The cable shall meet the requirements of the serving utility company and be furnished to operate on the existing system as field verified by the contractor.

B. Manufacturers

1. Medium voltage conductors shall be manufactured by one of the following:

   a. General Cable
   b. Southwire
   c. Superior Essex
   d. Okonite

C. Cable Description

1. Conductor: The Class B concentric copper conductor size shall be as listed on the drawings and meet ASTM B3, and ASTM B8 or ASTM B496.

2. Strand Screen: The strand screen shall consist of an extruded semiconducting Polymeric layer over the conductor.
3. Insulation: The high quality EPR compound shall be lead free thermosetting elastomer. The insulation shall comply with the referenced specifications and shall be as follows:

<table>
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<tr>
<th>Rated Voltage (Phase to Phase) kV</th>
<th>Conductor Size AWG or MCM</th>
<th>Insulation Thickness (Mils)</th>
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<td>15</td>
<td>2 – 1,000</td>
<td>220 (133%)</td>
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D. Insulation Shielding

1. The semi-conducting insulation shielding shall be triple extruded. The thermosetting material shall meet the requirements of the referenced specifications. Extruded semi-conducting thermoplastic systems will not be acceptable.

E. Metallic Shielding

1. The minimum non-magnetic, metallic shield shall conform to UL 1072, except that a helically applied copper tape shall be at least 5 mils thick and have a minimum lap of 25%.

F. Jacket

1. A PVC jacket shall be tightly extruded over the underlying core. The jacket shall be PVC and shall comply with the referenced specifications. The overall jacket shall be printed at intervals not exceeding 24" with the following information:
   a. Manufacturer's name
   b. Plant of manufacture (Designation Code)
   c. Trade name
   d. Insulation type and thickness
   e. Conductor size and type ("Cu")
   f. Maximum working voltage and insulation level
   g. UL Type designation of cable (MV-105)
   h. UL identification - ("UL")
   i. UL rating(s), as applicable
   j. Year of manufacture

G. Factory Tests

1. Tests on completed cable shall be in accordance with AEIC CS-8 and ICEA S-93-639. Certified test reports shall be provided at time of shipment. These certified copies shall include copies of actual production test values. If the cable is drawn from a previously manufactured inventory program, Certificates of Compliance and documentation of AEIC CS-6 Qualification shall be provided prior to shipment. The cable shall also be tested as described under Part 3 of these specifications.

H. Packaging

1. Each cable length shall be durably sealed before shipment to prevent entrance of moisture. Reels and reel markings shall comply with AEIC CS-8 and ICEA S-93-639. The Electrical Contractor shall provide the manufacturer with suitable shipping lengths subject to a ±0.5% tolerance.

I. Installation

1. New cables shall be pulled through existing and new ductbanks as indicated on the drawings. Cable tension shall be monitored and shall not exceed the manufacturer's limitations.
2. Extreme caution shall be exercised while pulling cable, since energized feeders shall be present in existing manholes and ductbanks.

J. Cable Splicing and Termination Kits

1. Heat Shrink Kits

   a. Power cable splices and terminations for shielded solid dielectric plastic cables shall be factory engineered kits containing all necessary components to reinstate primary cable insulation, metallic shielding and grounding systems and overall jacket to the equivalent of the cable itself.

   b. Splices and terminations shall be of a uniform cross-section, heat-shrinkable polymeric construction utilizing linear stress relief and high dielectric strength insulating layers. The outer insulating layer shall be bonded to a conducting layer for shielding. The splice shall be rejacketed with a heavy-wall, heat-shrinkable lined sleeve to provide a waterproof hot melt adhesive seal.

   c. The splice or termination shall accommodate a range of cable sizes and be completely independent of cable manufacturers tolerances.

   d. When assembled on cables, the splice or termination shall be capable of passing the electrical test requirements of IEEE 48-1975, IEEE 404-1986 and water immersion tests of ANSI-C 119.2-1974.

      1) Splice and termination kit manufacturer shall provide a test report demonstrating compliance with the above requirements.

   e. Splice and termination kit manufacturer shall provide on-site demonstrations for the Electrical Subcontractor and shall provide supervision of each splice.

   f. Splices and terminations shall be manufactured by Elastimold / T&B / ABB or Raychem Corporation.

2. Modular, Reconnectable Splice and Termination Kits

   a. Power cable splices and terminations for shielded solid dielectric plastic cables shall be factory engineered kits containing all necessary components to reinstate primary cable insulation, metallic shielding and grounding systems and overall jacket to the equivalent of the cable itself.

   b. Modular splices and terminations shall form a 200 ampere, separable, insulated connection. Splices shall be 15 kV and meet the requirements of ANSI/IEEE Standard 386.

   c. When assembled on cables, the splice or termination shall be capable of passing the electrical test requirements of IEEE 48-1975, IEEE 404-1986 and water immersion test of ANSI-C 119.2-1974.

      1) Splice and termination kit manufacturer shall provide a test report demonstrating compliance with the above requirement.

   d. Splices and terminations shall be manufactured by 3M, Elastimold or Cooper-Eaton or approved equal.

   e. Select connector to match primary cable rating and configuration and furnish complete with all accessories, fittings, adapters and installation methods to match the requirements of the new and existing system components.
Section 26 05 30 Wiring Methods, subsection 3.2 Installation:
INSERT: 3.2.I Medium Voltage Conductors

I. Medium Voltage Conductors

1. Provide the voltage rating, size, conductor material and number of cables indicated on the drawings.
2. Install cable identification tags on each cable at each point of access.
3. Install cables in continuous lengths whenever possible. Splices are permitted only at manholes and other points of access.
4. While pulling the cable, the maximum pulling tension as provided by the cable manufacturer shall not be exceeded. The pulling tension shall be monitored using dynamometer and recorded.
5. While pulling the cable, each individual conductor shall be attached to the pulling lead with the ball bearing swivel enabling each conductor to turn independently while being pulled.
6. While pulling the cable, cable lubricating compound(s) as recommended by manufacturer shall be used.
7. While pulling, each cable in the set shall be positively identified by a method selected by General Contractor.
8. Provide continuous insulation shielding through all splices and ground shielding at each splice and termination unless otherwise indicated on drawings.

Section 312000 – Earth Moving - ADD new section

Section 312500 – Erosion Control – ADD new section

Section 350500 – Basic Seawater System Materials
DELETE Section in its entirety.
REPLACE with the attached Section 350500
REVISE – Drawing list has been updated Drawing Title corrected SW01, SW02, SW05, SW06, SW10, SW13, and SW14
REVISE – Section numbering formatting error has been corrected for the out of sequence numbers.
REVISE – Section 1.12.B Delete reference to “Section 019110 General Commissioning Requirements”
DELETE – Delete section 1.26
DELETE – Delete Section 1.40

Section 350590 – Seawater Pumps
DELETE Section in its entirety.
REPLACE with the attached Section 350590.

Section 350830 SEAWATER PROCESS CONTROLS
REVISE Section 2.1.B
1. The SSI will be a subcontractor to the Seawater Piping Contractor.
2. All specialty devices, sensors and control panels shall be provided via the SSI. Any materials needed for the physical installation of these devices (e.g. conduit, clips, hangers, junction boxes, cabling, etc.) shall be the responsibility of the Seawater Piping Contractors electrical sub-contractor.

Section 350840 – Seawater System Deduct Alternates
DELETE Section in its entirety.
REPLACE with the attached Section 350840

Section 41 22 23 – Hoists
DELETE Section in its entirety.

DRAWINGS/PLANS (Dated 03/29/2019 )
REVISED Drawings:
Flowing Seawater Laboratory Renovation & Infrastructure Upgrades Page 6 of 10 Addendum 1
T0.1 (Drawing not re-issued)
- **ADD** to Drawing List : S2.1 Typical Details
- **ADD** to Drawing List : C1.0 Site Civil Details
- **REVISE** Drawing List title for SW13 to: SEAWATER SYSTEM EAST WALL BAG FILTERS

D1.0 (Drawing not re-issued)
- **DELETE** Note 1 in its entirety.
  - **REPLACE** with 1. OWNER TO REMOVE EXISTING WALLS AND DOORS AT THESE LOCATIONS. CONTRACTOR TO REMOVE CONCRETE BASE CURB. CURB TO BE GROUND SMOOTH TO ACCEPT FLOORING.
- **DELETE** Note 3 in its entirety.
  - **REPLACE** with OWNER TO REMOVE ALL EXISTING CASEWORK, COUNTERS, AND CEILINGS FROM THESE ROOMS.

A0.1 – See clouded changes.
A1.0 – See clouded changes.
A1.0A – See clouded changes.
A2.0 - See clouded changes.
A3.0 - See clouded changes.
P1.0 - See clouded changes.
E0.1 – See clouded changes.
E0.2 – See clouded changes.
E2.0 – See clouded changes.
E4.0 – See clouded changes.
SW13 (Drawing not re-issued)
- **REVISE** drawing title to: SEAWATER SYSTEM EAST WALL BAG FILTERS

**ADD New Drawings:**
- C1.0 Site Civil Details
- S2.1 Typical Details

**RESPONSE TO QUESTIONS**

1. **Question:** On the sectional door they have full view in the spec and on the plans it calls for a pass door (nothing in the spec). My supplier is saying we can put a pass door in the full view, but we need a min 34” above the header so we can have 2’ of high lift. The bottom section cannot be in the horizontal plane.
   **Answer:** There is only 18” above the existing garage door header. We reached out to one of the specified manufactures and confirmed that the clearance is acceptable.

2. **Question:** There is quite a bit of conduit, romex cabling, and other items to try and paint around on the underside of the floor. Spraying around may not reach the intended surface. Can you expound on what is acceptable for the final outcome of the effort? Should we remove old nails and clips that are obsolete?
   **Answer:** All existing structure and services should be painted that do not have a factory finish. All new plumbing lines and electrical conduits should also be painted. Any valves, valve tags, switches, detectors, new light fixtures, new FCU, and seawater systems should NOT be painted. The outcome of the ceiling painting is to have a continuously painted ceiling with new seawater and lighting systems suspended below. The Owner is currently removing many old and obsolete systems. Yes, old nails and clips not being utilized should be removed.

3. **Question:** The concrete slab in places has chunks missing, typically along edge of trench drain. There are also some round covers, maybe for a valve in the slab, which are quite rusted and falling apart. What is intended for these situations?
   **Answer:** At any location on the floor or up the perimeter concrete curb where there is concrete spawning or a surface that will not accept the epoxy coating, repair those locations according to the manufacturer’s recommendations for their flooring warranty. All metal supports for the trench drains
should be ground smooth to accept the epoxy coating. Trench angles too rusted to accept epoxy, to be removed and replaced in kind. Clean metal edges around covers to receive epoxy flooring Covers will be replaced by Owner.

4. Question: Is there a detail or spec for the new fiberglass trench drain covers?
   Answer: Provide replacement trench drain covers to match or equal to Zurn GG Fiberglass Slotted Grates, Dura Trench, or approved equal.

5. Question: Section 12 35 53.23 section 2.3, A, 1 It is asking for Fire Resistance: Class C (ASTM E84) material. To meet this spec we would need to quote a Flame Retardant Polypro that meets a FM 4910 rating.
   Answer: This rating is not required.

   Answer: All trim to be smooth white PVC with concealed fasteners, cleaned and left unpainted. The siding should be factory primed and painted. Architect to choose from full line of available standard colors.

7. Question: Testing Costs: Please confirm that the Owner is paying the cost of testing it wishes performed.
   Answer: The Owner will pay for all required code testing.

8. Question: Epoxy Coating. A1.0A, Detail 4; and D1.0, Note 4. D1.0 Note 4 says the support angle should be ground and coated. A1.0A Detail 4 indicates the whole drain is to be epoxy coated. Is so, would sandblasting be an acceptable means of prep?
   Answer: We have no objection to this type of preparation as long as the epoxy flooring manufacture provides a warranty and proper care is taken to protect the surrounding areas.

9. Question: Is there a coating on the pump house slab?
   Answer: Yes, refer to section 09 67 70.

10. Question: Since everyone has cell phones now, are you still requiring installation of phone service?
    Answer: Conduits shown on the drawings are to be installed. Owner will supply and install all phone and data in the future.

11. Question: Use of power: Is it acceptable to use the power in the lab for whatever work is required?
    Answer: No. There is a limit to what power is available. Existing power will be made available for the Contractor’s convenience. Any additional power above and beyond existing circuits will be the responsibility of the Contractor to provide.

12. Question: We are working with Hascall and Hall to price painting the floor. They would like to know if the attached dur-a-crete product would be an acceptable alternate. The system would go as follows... -Trowel Dur-A-Crete out at ¼” thickness -Install Dur-A-Gard topcoat with Dur-A-Crete hardener at 100 SF per gallon.
    Answer: Any material or materials not specified in the bidding document but worthy of consideration may be introduced by the bidder by a separate letter attached to the Bid. A cost comparison must be included giving the comparison with the Material specified and the reason for the suggested substitution. The basic bid shall be as specified.

13. Question: Is the foundation for the pump house located in ledge?
    Answer: There are currently no borings showing the level of ledge at the location of the pump house. Ledge is anticipated to be approximately at elevation 9’-0”. The contractors bid should be based on ledge removal from an average elevation 9’-0” to install the pump house foundation and compacted stone to the elevations indicated on A3.0.

14. Question: Is this project “Buy America”?
    Answer: Recipients are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this Award.
15. **Question:** I see in the specification you want a engineer's phone, but I don't see a specification for Engineers Facilities, trailer... Is a trailer required?

   **Answer:** A trailer is not required for the project. In Section 01 50 00.1A Items 6, 10, 11, 20, 21, 24, 25, 27, and 30 are not project required, but can be implemented at the Contractors discretion.

16. **Question:** I don't see sizes of pass doors, overhead doors or windows on the plans and specifications. Can you provide a door and window schedule? Door specification references section 08 71 00 for hardware. I don't see a hardware specification on the plans and specifications? Please provide one so we can price the hardware. Please provide a specification for fiberglass grating.

   **Answer:** Refer to Addendum 1 for door, hardware, and window information. Section 08 71 00 is not part of the specifications. Provide replacement trench drain covers to match or equal to Zurn GG Fiberglass Slotted Grates, Dura Trench, or approved equal.

17. **Question:** Please advice where 09 67 70 sealed concrete finish gets installed.

   **Answer:** The pump house floor.

18. **Question:** Can earthwork specifications be provided?

   **Answer:** Yes refer to Addendum 1.

19. **Questions:** Do we assume no paving?

   **Answer:** Yes, there is no paving scope.

20. **Question:** Any special erosion control measures?

   **Answer:** Refer to C0.1 and Division 32 for erosion control measures.

21. **Question:** During installation of the temporary intake do we need to take special precautions for turbidity contamination of current intake? Will a silt boom be required?

   **Answer:** No special requirements. No silt boom is required.

22. **Question:** Currently the site for the building is mostly gravel, do we need to loam and seed? If so please provide a plan of the extent of loam and seed.

   **Answer:** Refer to C0.1 for loam and seed requirements. All areas disrupted around the pump house installation and tree removal to be addressed as outlined.

23. **Question:** Is there a pit for the sea water pipe entrance next to the oh door. Sea water plans show the pit but I don't see the pit on the architectural plans.

   **Answer:** Refer to A1.0; the pit is called out there.

24. **Question:** Wall type 1A calls for a new layer of ½-inch fiberboard. Fiberboard does not come in half inch. We would have to use 5/8”.

   **Answer:** The Basis-of-Design is USG Fiberock Brand/ Aqua-Tough AR Interior Panel, Gold Bond® eXP® Interior Extreme® AR Gypsum Panel, or an approved equal. – Level 5 finish – or Architect acceptable equivalent. These products come in ¼”.

25. **Question:** I noticed on page D1.0, in the drawings, that there was a note for an epoxy coating for the drain support angles, but I could not find any information on what the epoxy coating would be, do you have any insight on that? Also, on page A1.0 there are wood and steel columns that are noted as needing re-priming and re-coating with epoxy paint, do you know what that system might be? I may’ve overlooked it, but I could not find any information on pipe painting that needs to be done in the renovation or new pump building. Does the inside of the trench drains get coated? Does the existing floor coating system need to be removed or is this a coat over? If it is a coat over what is the existing coating system?

   **Answer:** The floor epoxy coating system is to be brought across the support angles into the trench. The inside of the trench gets coated. Refer to revised painting specification for Steel Substrates. Piping will get painted along with the ceiling system paint. No seawater piping will be painted. The floor will need to get prepared per the manufacturer’s recommendations. This is not a simple coat over.
26. **Question:** Please provide a specification for the temporary 4” tiger flex hose or at least provide the pressure rating.
   **Answer:** This hose is shown on SW15, “Temporary seawater pumping and piping details” 4” Tiger Green Hose #TG400.

27. **Question:** Sheet SW05 shows a alum structural I beam 8’ above the floor provided by others. Does others mean the general contractor and not the seawater contractor? Is the beam going to be used as a pipe support or to reinforce the walls? This beam is not shown on the architectural plans, please clarify.
   **Answer:** This beam is shown on A3.0 and W10x22 with 4x4 support tubes all galvanized.

**GENERAL**

1. The attendance sign-in sheet for the mandatory pre-bid walk-through held on Tuesday, March 19, 2019 is attached for informational purposes only.
2. Provide continuous pedestrian access to building entry door at Lower Hall and to Room 124 Incubator Lab #8 throughout construction.

END OF ADDENDUM 1
## PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

### Division 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

#### Introductory Information

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#### Procurement Requirements

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#### Contracting Requirements

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**Flowing Seawater Laboratory Renovation & Infrastructure Upgrades**

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**SPECIFICATIONS GROUP**

**GENERAL REQUIREMENTS SUBGROUP**

Division 01 – GENERAL REQUIREMENTS

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**Division 42 - 48 NOT USED**

END OF DOCUMENT 00 01 10
SECTION 00 41 13
BID FORM – SHORT FORM

BIDDER: ____________________________________________

Physical/Street Address ________________________________

City, State ZIP _______________________________________

University of Maine
Office of Facilities Management
Carolyn McDonough, Director of Capital Planning & Project Management
5765 Service Building, Room 111
Orono ME 04469-5765

Having carefully examined the form of contract, general conditions and plans and specifications contained therein for
FLOWING SEAWATER LABORATORY RENOVATION & INFRASTRUCTURE UPGRADES, as well as the
premises and conditions affecting the work, we the undersigned propose to furnish all labor, equipment and materials
necessary for and reasonably incidental to the construction and completion of this contract for the sum of

$ ____________________________

Alternate prices as follows: The alternates, if necessary, are listed in the order in which they are to be applied. Note the
Deduct/Alternates are not being used to reduce EDA project scope.

Deduct/Alternate 1: New Hayward Bag Filter System (see Section 01 23 00) $ _______________
Deduct/Alternate 2: New Seawater Heating System (see Section 01 23 00) $ _______________
Deduct/Alternate 3: New Heat Pump Station (see Section 01 23 00) $ _______________
Deduct/Alternate 4: New 800 amp Building Feeder (see Section 01 23 00) $ _______________

Unit Prices as follows: Provide all costs to, receive, install, start-up, commission, and warranty the following equipment
provided by the Owner (OFCl) for the completion of the seawater system. All utility connections to each piece of
University supplied equipment is furnished and installed by the contractor.

Unit Price 1: Install Dura-tech Fiberglass Seawater Intakes – SW03 $ _______________
Unit Price 2: Install (2) -8” Intake Suction Hoses – SW03 $ _______________
Unit Price 3: Install CSSI Degasser System – SW12 $ _______________
Unit Price 4: Install Aqualogic 10 Ton Heat Pump - SW10 $ _______________
Unit Price 5: Install Hayward Bag Filters - SW13 $ _______________
Unit Price 6: Install Seawater Process & Automation Controls - SW17 $ _______________
Unit Price 7: Install Q-VAC #QVP-14RV-60HG-AP (02) Vacuum Priming System $ _______________

This proposal includes the cost of 100% Performance Bond plus 100% Payment Bond.

The receipt of the following addenda to plans and specifications is hereby acknowledged:

ADDENDUM # _______ DATED ________________ ADDENDUM # _______ DATED ________________
ADDENDUM # _______ DATED ________________ ADDENDUM # _______ DATED ________________

Any material or materials not specified in the bidding document but worthy of consideration may be introduced by the
bidder by a separate letter attached to this Bid. A cost comparison must be included giving the comparison with the
Material specified and the reason for the suggested substitution. The basic bid shall be as specified.
The undersigned agrees, if this Bid is accepted to sign a contract and deliver it, along with the bonds and affidavits for all insurance specified within twelve (12) calendar days after the date of notification of such acceptance, except if the 12th day falls on a Saturday, Sunday or holiday, then the conditions will be fulfilled if the required documents are received before 12 o’clock noon on the day following the holiday, or the Monday following the Saturday or Sunday, and as a guarantee thereof, herewith submits a bid bond as required.

The undersigned agrees, if awarded the Contract, to complete the work on or before November 29, 2019. The undersigned also agrees, if awarded the Contract, that no more than 80% of the contract amount will be sublet to other contractors.

Signed (by individual authorized to sign contract) __________________________

By (printed name & title) __________________________ Phone __________

PO Box (if applicable) __________________________ Email __________

NOTE: If bidder is a corporation, write State of Incorporation, and if a partnership, give full names of all partners.

END OF SECTION 00 41 13
PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. General: This project has the following alternates if necessary, listed in the order for which they are to be applied. Deduct/Alternates are not being used to reduce EDA project scope.

B. Deduct/Alternate #1:

1. Deduct the cost to install two (2) (OFCI) Hayward Bag Filter Systems depicted on DWGs SW-07, SW-08, SW-12, SW-13, and SW-16 and described in specification section 350580 section 2C. This shall include the six (6) Hayward Bag Filters Model # FLV4P2S20T4VS and all of the associated 4” Sch 80 PVC Piping, Valves and fittings. In lieu of the Hayward Bag Filter Systems consisting of three (3) Bag Filters each, provide instead the installation of a single (OFCI) Hayward Bag Filter Model # FLV4P2S20T4VS and 2” Sch 80 PVC Piping and 2” Spears PVC Ball Valves ON EACH Seawater Line A and B for a total of two (2) Hayward Bag Filters to provide some seawater filtration capabilities.

C. Deduct/Alternate #2:

1. Deduct the cost to install the entire Seawater Heating System depicted on DWGS SW-10, SW-11, SW-12, SW-16, SW-17 and SW-18 and described in specification section 350580 Section 2.1 and 350830. This shall include the two (2) (CFCI) Zodiac Heat Line Heat Exchangers Model # 70 and all of the associated PVC and Copper Piping, valves and fittings, the Belimo
Control Valve and the Heating Temperature Control Equipment and installation as described on Drawing SW-17 as well as the entire Seawater Degassing System as depicted on DWGs SW-08, SW-10, SW-12, SW-15, SW-17 and SW-18. which shall include the one (1) (OFCI) CSSI Degasser Model # SWCD-PVC-50-100T, the two (2) Hayward Pro Max Pumps, the two (2) Plast-O-Matic PVC Control valves and all of its associated PVC piping, valves, sensors and controls. In lieu of the Zodiac and CSSI Degassing Seawater Heating System the Owner will furnish one (1) 4 KW Aqualogic In-Line Titanium Electric Heater with Temperature Controller Model #TIL5 Electric shall be 230 Volt 1 Phase. No Contractor installation required.

D. Deduct/Alternate #3:

1. Deduct the cost to install one (1) (OFCI) 10 ton Aqualogic Heat Pump Model #HP-7 230 volt 3 phase depicted on DWGS SW-10, SW-11, SW-12, SW-16 and SW-18 and described in specification section 350580 section 2.3. Also delete the single phase to three phase digital inverter. Provide the cost reduction value which shall include the installation of the Aqualogic Heat Pump #HP-7 and all of its associated PVC piping, valves, fittings, housekeeping pad and electrical service and in lieu of the Aqualogic Heat Pump Model HP-7 the Owner will provide one (1) ½ hp Aqua Logic Cyclone Chiller Model #CY-5 with Temperature Controller and submersible Titanium Helix Refrigerant Wand for individual tank cooling capability. Electric shall be 110V 1 phase 60 HZ. No Contractor installation required.

E. Deduct/Alternate #4:

1. Delete new 800 amp service, including MDP, service feeder, utility connection, transformer installation, service grounding and feeders. Install new 200 amp service breaker connected from transformer secondary conductors to serve new pump house panel, including wiring.

END OF SECTION 01 23 00
PART 1  GENERAL

1.1  SUMMARY

A. Work of this Section consists of surface preparation and field painting of the following:

1. Exposed surfaces without factory-applied architectural finish.
2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 General Requirements Specification Sections, apply to this Section.
2. Section 06 20 00 - FINISH CARPENTRY.
3. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES.
4. Section 08 14 16 - FLUSH WOOD DOORS.
5. Section 09 29 00 - GYPSUM BOARD.

1.2  SYSTEM DESCRIPTION

A. General System Description

1. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural.
   a. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors.
   b. If the schedules do not indicate color or finish, the Designer will select from standard colors and finishes available.
2. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and ironwork, and primed metal surfaces of mechanical and electrical equipment. Exposed MEP items scheduled in the Finish Schedule shall be painted the same color.
3. Do not paint pre-finished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   a. Pre-finished items include the following factory-finished components:
      1). Architectural woodwork and casework
      2). Light fixtures
      3). Distribution cabinets
   b. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      1). Furred areas
      2). Ceiling plenums
      3). Pipe spaces
      4). Duct shafts
   c. Finished metal surfaces include the following:
      1). Pre-finished Aluminum: Anodized, or fluoropolymer, silicone-modified polyester (SMP), polyester or acrylic coating system.
      2). Stainless steel
      3). Bronze and brass
      4). Galvanized steel, unless noted otherwise.
   d. Operating parts include moving parts of operating equipment and the following:
      1). Valve and damper operators.
2). Linkages.
3). Sensing devices.
4). Motor and fan shafts.
e). Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

B. Warranty: Furnish Manufacturer warranty for a period of Seven (7) years.

1.3 SUBMITTALS

A. Product Data: Provide product sheet, including product description and use, for each product proposed for use.

1. Product Data should indicate coating conforms to federal, state, and local regulations, including VOC compliance with the requirements of this Section.
2. Manufacturer’s installation instructions.

B. Samples

1. Initial: Provide manufacturer’s standard color chart(s) for color selection by Architect.
2. Provide painted samples on each substrate type to be painted, showing representative color and sheen as selected by Architect. Show step down of prime and finish system.
   a. Concrete: Provide two 12 inch square samples for each finish.
   b. Painted Wood: Provide two 12 inch square samples of each color and material on hardboard.
   c. Stained or Natural Wood: Provide two 4 by 8 inch samples of natural- or stained-wood finish on actual wood surfaces.
   d. Ferrous Metal: Provide two 4 inch square samples of flat metal and two 8 inch long samples of solid metal for each color and finish.

C. Site samples, Mock-Ups: Include two (2) 100 sq.ft. “brushout” samples of each interior color and each exterior color for Architect's review and acceptance. Architect may request samples on walls and ceilings and require mock-up of actual lighting conditions in spaces where “brushouts” are made.

1. Provide up to two brushout samples for each interior colors.

D. Submit environmental data in accordance with ASTM E2129, Table 1, for products provided under Work of this Section.

E. Closeout Submittals: Provide list of each product provided including:

1. Manufacturer
2. Product name/number
3. Sheen
4. Color name/number
5. Schedule showing locations and substrates.

F. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.


C. Site applied interior primers, paints, and coatings: Comply with CA 01350.
1.5 DELIVERY STORAGE AND HANDLING

A. Deliver painting materials in sealed, original labeled containers bearing manufacturer’s name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

B. Store paint materials in original labeled containers in a secure (lockable) dry, heated and well ventilate single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 45 deg F. Only material used on this project to be stored on site.

1. Where toxic and/or volatile/explosive/flammable materials are being used, provide adequate fireproof storage lockers and take necessary precautions and post adequate warnings as required.
2. Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop cloths) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.
3. Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide products from a single manufacturer. Design is based upon products of the manufacturer listed as the Basis of Design. Subject to compliance with design and performance requirements, additional manufacturers may include but are not limited to one of the following:

1. Basis of Design: Paints by Sherwin-Williams Company; or paints by other acceptable equivalent manufacturers, with products subject to requirements, as follows:
   a. AFM Enterprises
   b. BioShield Paint - Eco Design Co.
   c. Benjamin Moore.
   d. PPG Industries
   e. Tnemec
   f. Architect acceptable equivalent.

B. High Performance Paint Coatings: Provide products of one of the following manufacturers, or approved equal that meet or exceed specified requirements:

1. Valspar Co. (Valspar).
2. Tnemec Company, Inc. (Tnemec).
4. Or approved equal.

C. Materials used shall be best grade products of their respective kinds. The Painting Schedule is based on products the above named manufacturers. These are specified to establish a standard of quality and kind of material desired. Provide these products, or equals as approved by Architect.

D. If substitutes are proposed, submit complete schedule showing materials specified and equivalent materials proposed as substitutes. Provide complete manufacturer's product data on proposed materials. Substitutes must be approved by Architect before commitment for materials is made.

E. Assume full responsibility for proper performance of materials, for method of application, and for compatibility of materials applied over shop coats or other coats previously applied, including but limited to primers, sealers, preservative treatments, etc. Notwithstanding specific schedules in this Section, select primers which have been verified to be appropriate for each of the substrates and finishes encountered.

F. Provide miscellaneous painting materials such as linseed oil, shellac, turpentine, and thinner of the
highest quality.

2.2 COLORS

A. Provide colors in accordance with schedule provided by Architect. Tint and match colors to the satisfaction of Architect. Provide facilities for comparison and adjustment of colors.

B. Paint or coatings of other manufacturers as listed herein will be acceptable provided that the paint or coating meets or exceeds the quality of paint or coating specified and that the paint or coating may be tinted as required to provide an acceptable color match and appropriate degree of gloss, acceptable to the Architect.

C. Tint and match colors to the satisfaction of Architect. Provide facilities for comparison and adjustment of colors.

D. No limit is placed on number of colors that may be required; however the following maximum number of colors may be used in any one room, area, or surface:
   1. Four colors.

2.3 FILLERS, SOLVENTS, AND MISCELLANEOUS MATERIALS


C. Tinting Materials: Best quality, ground in pure boiled linseed oil, limeproof, and non-fading.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Unless specifically pre-approved by the applied product manufacturer, perform no painting or decorating work when the ambient air and substrate temperatures are below 50 deg F for both interior and exterior work.

B. Perform no exterior painting work unless environmental conditions are within MPI and paint manufacturer’s requirements or until adequate weather protection is provided. Where required, suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after paint application.

C. Perform no interior painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application.
   1. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

D. Perform no painting or decorating work when the relative humidity is above 85% or when the dew point is less than 5 deg F variance between the air / surface temperature.

E. Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
   1. 12% for concrete and masonry (clay and concrete brick/block).
   2. 15% for wood.
   3. 12% for plaster and gypsum board.

F. Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.
G. Test concrete, masonry and plaster surfaces for alkalinity as required.
   1. Concrete and masonry surfaces must be installed at least 28 days prior to painting and decorating work and must be visually dry on both sides.

H. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

I. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be painted or decorated. Adequate lighting facilities shall be provided by the General Contractor.

3.2 EXAMINATION

A. Carefully examine areas with Installer present, for compliance with requirements affecting Work performance.
   1. Verification of Conditions: Verify that scheduled surfaces, substrates, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.

B. Do not proceed with painting Work until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Prepare all surfaces in accordance with MPI requirements. Refer to the MPI Painting Manual in regard to specific requirements for the following:
   1. Environmental conditions.
   2. pH testing.
   3. Acid etching.
   4. Rust stain removal.
   5. Asphalt surfaces.
   7. Concrete masonry units.
   8. Structural steel and miscellaneous metals.
   10. Aluminum and copper surfaces.
   11. Dimension and dressed lumber.
   12. Wood doors.
   13. Wood paneling and casework.
   15. Acoustical panels and tiles.

B. Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.

C. Remove and securely store all miscellaneous hardware and surface fittings / fastenings (e.g. electrical plates, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops), removable rating / hazard / instruction labels, washroom accessories, light fixture trim, etc. from wall and ceiling surfaces, doors and frames, prior to painting. Carefully clean and replace all such items upon completion of painting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before painting to paint bottom and top edges and then re-hung.

D. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.
E. Substrate defects shall be made good and sanded by others ready for painting particularly after the first coat of paint. Start of finish painting of defective surfaces (e.g. gypsum board) shall indicate acceptance of substrate and any costs of making good defects shall be borne by the painter including re-painting of entire defective surface (no touch-up painting).

F. Confirm preparation and primer used with fabricator of steel items.

3.4 APPLICATION

A. Do not paint unless substrates are acceptable and/or until all environmental conditions (heating, ventilation, lighting and completion of other subtrade work) are acceptable for applications of products.

B. Apply paint or stain in accordance with MPI Painting Manual Premium Grade finish requirements, unless indicated otherwise.

C. Apply paint and decorating material in a workmanlike manner using skilled and trade qualified applicators as noted under Quality Assurance.

D. Apply paint and coatings within an appropriate time frame after cleaning when environmental conditions encourage flash-rusting, rusting, contamination or the manufacturer’s paint specifications require earlier applications.

E. Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer’s recommendations.

F. Tint each coat of paint progressively lighter to enable confirmation of number of coats.

G. Unless otherwise approved by the painting inspection agency, apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.

H. Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 39 inches.

I. Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer’s directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.

J. Prime coat of stain or varnish finishes may be reduced in accordance with manufacturer’s directions.

K. Paint finish shall continue through behind all wall-mounted items (e.g. chalk and tack boards).

3.5 FIELD QUALITY CONTROL

A. Site Tests, Inspection: Architect to perform random DFT thickness gauge readings to verify application of specified paint system dry film thickness (DFT).

3.6 FINAL PAINTING SCHEDULE

A. Paint Schedule: The following lists the more typical surfaces encountered and the paint types to be utilized. Specify one tinted primer coat and two finish coats for each surface, except as noted

B. Steel Substrates:

1. 1st Coat:
   a. Corotech Acrylic Metal Primer V110.
   b. S-W Pro-Cryl Universal Primer, B66-310 Series
   c. Equal by another named manufacturer.

2. 2nd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
c. Equal by another named manufacturer.

3. 3rd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

C. Exposed MEP (galvanized):

1. 1st Coat:
   b. S-W Pro-Cryl Universal Primer, B66-310 Series
   c. Equal by another named manufacturer.

2. 2nd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

3. 3rd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

D. Wood Substrates:

1. 1st Coat:
   a. Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046.
   b. S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
   c. Equal by another named manufacturer.

2. 2nd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

3. 3rd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

E. Gypsum Board Substrates:

1. 1st Coat:
   a. Benjamin Moore Fresh Start Multi-Purpose Primer N023.
   b. S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
   c. Equal by another named manufacturer.

2. 2nd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

3. 3rd Coat:
   a. Corotech Pre-Catalyzed Waterborne Epoxy V342.
   b. S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series
   c. Equal by another named manufacturer.

3.7 WASTE MANAGEMENT

A. Separate and dispose of waste in accordance with the Project’s Waste Management Plan.

END OF SECTION 09 91 00
SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade walks pavements lawns and grasses.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase and base course for concrete walks and pavements.
5. Subbase and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling for site utility trenches.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
9. Excavation and off-site disposal of all unsuitable and excess materials and stockpiling of all suitable onsite materials required for reuse.
10. Provision, transportation and placement of all required fill and backfill materials.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavation more than 10 feet in width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 2 cu. yd. (1.52 cu. m) for bulk excavation or 1 cu. yd. (0.76 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course.

K. Subgrade: Uppermost surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Geotextile fabrics.

B. Samples: 12-by-12-inch Sample of subdrainage and geotextile.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

D. Blasting Plan: For record purposes; approved by authorities having jurisdiction.

E. Seismic Survey Report: For record purposes; from seismic survey agency.
F. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

G. Earth Material Samples: Contractor shall be responsible for obtaining samples (50 lb. minimum) of earthwork materials proposed to be used and transporting them to the site seven calendar days in advance of the time planned for incorporating them into the work. Use of proposed materials by the Contractor prior to testing and approval or rejection shall be at the Contractor’s risk. The following information shall be submitted with the samples:

1. Location of borrow source site.
2. Present and past usage of the source site and material.
3. Any previously existing report(s) associated with an assessment of the source site, as relates to the presence of oil or hazardous material.
4. Location within the source site from which the material will be obtained.

H. Up to three test series (gradation and laboratory compaction) will be completed by the geotechnical engineer or owner’s agent for off-site borrow sources for each category of earth materials defined in Part 2 of this Section at the Owner’s cost. Testing of additional samples or sources shall be at the Contractor’s cost. Retesting of failed results as noted above shall be at the Contractor’s cost.

1. Sieve analysis to be based on washed sieve analysis in accordance with appropriate ASTM Standard.

I. Material Test Reports: For each on site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.
3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Earthwork Observation and Testing:

1. The owner and/or owner’s agent will retain a qualified Geotechnical Engineer and/or testing agency to perform onsite observation and testing during work under this and related sections and as indicated in the "Schedule of Special Inspections." The services of the geotechnical engineer/testing agency may include, but not be limited to, the following:

a. Observation during excavation, subgrade preparation and backfill for footings, slabs-on-grade, and subsurface drainage construction, etc.
b. Determination of requirements for additional excavation to remove unsuitable materials.
c. Observation and testing during placement and compaction of fill and backfill.
d. Laboratory testing and analysis of fill materials specified.
e. Review of submittals.

2. During the course of construction, the Geotechnical Engineer/testing agency shall advise the owner’s agent, in writing, with a copy to the Architect and Contractor, if at any time, in his opinion, the work is not in substantial conformity with the plans and specifications. The Geotechnical Engineer’s and/or testing agency’s presence does not include supervision of direction of the actual work by the Contractor, his employees, subcontractors or agents. Neither the presence of the geotechnical engineer and/or testing agency, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.

3. Testing equipment will be provided by and testing performed by the Geotechnical Engineer and/or testing agency, except as otherwise provided by contract. Upon request by the owner’s agent, the Contractor shall provide such auxiliary personnel and services as needed to accomplish testing work and to repair damage caused thereby to permanent work.

4. References herein to observations, testing and determinations by the "Engineer" include services to be provided by the Geotechnical Engineer and/or testing agency when appropriate and when so authorized by the engineer or owner.

C. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
   1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
   2. Seismographic monitoring during blasting operations.

D. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
   1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
   2. Seismographic monitoring during blasting operations.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
B. Existing Utilities:

1. Notify utility locator service for area where project is located before site clearing or excavating. Contact Dig Safe not less than 3 business days before starting the work. Dig Safe requirements are in addition to local and/or State DOT street opening permit requirements.

2. Hire private utility mark-out service for areas not marked by utility companies. See the "General Conditions" of the construction contract.

3. Before starting excavation, establish location and extent of any underground utilities occurring in work area. Make arrangements with appropriate utility company for removal and relocation of lines which are in the way of excavation. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

4. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for direction. Cooperate with owner, owner’s agent, and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

5. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on record drawings and reported in writing to owner’s agent. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff services if lines are active.

6. Do not interrupt existing utilities serving facilities occupied and used by owner or others, during occupied hours, except when permitted in writing by owner’s agency and then only after arranging to provided acceptable temporary utility services. Provide minimum of 48 hour notice to owner’s agent and receive written notice to proceed before interrupting any utility. Do not proceed with utility interruptions without owner’s written permission.

7. When in the course of the work it is necessary to connect a utility to a main in a public way, all the requirements of both the authorities governing the utility and those governing the public way shall be met. Pavement shall be temporarily and permanently replaced as directed by these authorities at no additional cost to the owner.

C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS - GENERAL

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2. Unsuitable Materials also include material containing excessive plastic clay, vegetation, organic matter, debris, pavement, stones or boulders over 6 inches in greatest dimension, and frozen material. Material which, in the opinion of the Geotechnical Engineer, will not provide a suitable foundation or subgrade.

D. On-Site Material: Any suitable material from on-site excavation.

E. Common Borrow: Inorganic mineral soil suitable for embankment construction free from frozen material, perishable rubble, peat and other unsuitable material. Refer to Geotechnical Report, S.W. Cole Engineering.

F. Unless indicated otherwise, materials shall conform to the "Standard Specification for Highways and Bridges" revision of November 2014, Maine Department of Transportation (abbreviated as MDOT "Standard Specification").

G. Granular Borrow: Granular borrow shall be obtained from suitable excavated onsite soil or offsite borrow sources for use as fill and backfill below and interior to building areas except where other materials are specified or detailed, and as detailed on the drawings. Granular fill shall consist of non-plastic naturally or artificially graded mixture of sound coarse and fine aggregates free of debris, waste, frozen materials and organics and conforming to the following gradation:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 40</td>
<td>0-70</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-20</td>
</tr>
</tbody>
</table>

H. Select Backfill: Use aggregate material for fill operations. Sieve analysis by weight:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Inch</td>
<td>100</td>
</tr>
<tr>
<td>3-Inch</td>
<td>90-100</td>
</tr>
<tr>
<td>¼ inch</td>
<td>25-90</td>
</tr>
<tr>
<td>No.40</td>
<td>0-30</td>
</tr>
<tr>
<td>No.200</td>
<td>0-2</td>
</tr>
</tbody>
</table>

I. 3/4 Inch Crushed Stone: Crushed stone shall be a quarry product 3/4 inch or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following gradation requirements for the nominal size indicated.

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Inch</td>
<td>100</td>
</tr>
</tbody>
</table>
J. Underdrain Filter Sand: Granular material for underdrain shall be free from organic matter and shall conform to the MDOT "Standard Specifications" Section 703.22 for Underdrain Type B.

K. Course Gravel: MDOT 703.22; underdrain backfill material Type C.

L. Rip Rap: Washed field stone or rough unhewn quarry stone as nearly uniform, in section as is practical. The stones shall be dense, resistant to the action of air and water, and suitable in all aspects for the purpose intended. The rip-rap shall be composed of a well-graded mixture down to the one-inch size particle such that 50 percent of the mixture by weight shall be larger than the D50 size specified on the drawings. A well-graded mixture is defined as a mixture composed primarily of the larger stone size but with a sufficient mixture of other sizes to fill the progressively smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the D50 size.

M. Drip Edge: 3/4 inch stone with an underdrain.

2.2 SOIL MATERIALS FOR ROADWAYS AND PARKING LOTS

A. Aggregate Subbase Material: Shall meet the requirements of Maine Department of Transportation Standard Specifications Section 703.06(c), Type D.

B. Aggregate Base Materials: Shall meet the requirements of MDOT Standard Specifications Section 703.06(a), Type A, and Section 703.06(a), Type B

2.3 SOIL MATERIALS FOR PAVEMENT SECTION AT BUILDING

A. Structural Fill: Hard, durable gravel containing only particles passing the 3" sieve. Sieve analysis by weight:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Inch</td>
<td>100</td>
</tr>
<tr>
<td>3 Inch</td>
<td>90-100</td>
</tr>
<tr>
<td>1/4 Inch</td>
<td>25-90</td>
</tr>
<tr>
<td>No. 40</td>
<td>0-30</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-6</td>
</tr>
</tbody>
</table>

2.4 UTILITY BEDDING MATERIALS

A. Sand: ASTM C 33; fine aggregate.
B. Crushed Stone Pipe Bedding Material: Shall be screened or crushed stone free of organic matter, silt, or clay lumps, and deleterious material. The material shall meet the following graduation requirements:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percent by Weight Passing Square Mesh Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Inch</td>
<td>100</td>
</tr>
<tr>
<td>¼ Inch</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2.5 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and measured per test methods referenced.

2.6 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

E. Provide protective construction fence around all landscaping in work area to remain.

F. Paved surfaces: Do not operate equipment on paved surfaces that will damage surface.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations.

2. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep all excavations and work sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction product or procedures nor cause excessive disturbance of underlying natural ground or footing and slab subgrades. Contractor shall similarly control water entering the excavation as a result of construction operations, such as washing of concrete equipment and tools and the like.

3. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health, nor damage to public or private property, existing work, or work in progress, nor to the surface of roads, walks and streets, nor cause any undue interference with the use of the same by the public. The Contractor shall comply with all applicable environmental protection and/or sediment/erosion control regulations.

4. Under no circumstances place concrete or fill, or lay piping or install appurtenances in excavations containing free water. Keep utility trenches free from water until pipe joint material has hardened.

3.3 SHEETING, SHORING AND BRACING

A. Provide sheeting, shoring and/or bracing at excavations as required to assure safety against collapse of earth or rock at sides of excavations; as required for support of adjacent structures, streets or utilities; or as required to comply with federal, state or local regulations, codes or ordinances.

B. Provide materials for sheeting, shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down sheeting, shoring and bracing as excavation progresses.

C. All sheeting and bracing not ordered left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities or property whether public or
private. All voids left after withdrawal of sheeting shall be immediately refilled with sand and rammed with tools especially adapted to that purpose or otherwise compacted as directed to achieve the required density.

3.4 EXPLOSIVES

A. Explosives: Explosives may be utilized for rock excavation. Use shall be conducted by a licensed, qualified contractor and governed by all Federal, State, County, and Local codes and laws.

B. General: Obtain approval of Owner before blasting. Perform blasting in accordance with the following:
5. Comply with all applicable laws, rules, ordinances, and regulations of the federal government, the State of Maine, and the Town of Scarborough, governing the transportation, storage, handling and use of explosives.
6. In case of conflict between regulations or between regulations and this Specification, comply with the strictest applicable codes, regulations or Specifications.
7. The Blasting Subcontractor for the project shall carry liability insurance (XCU) coverage in an amount no less than $2,000,000. A certificate of insurance documenting the coverage shall be provided prior to the start of construction. The insurance shall be in force for the duration of blasting at the site.

C. Before the start of blasting work, pre-blast condition surveys shall be conducted by the Site Contractor of all existing structures and conditions on the site, adjacent to the site, or in the vicinity of the site. These surveys shall extend to such structures or items that may be affected by blasting operations. As a minimum, condition surveys shall be performed on all structures within 500 feet of anticipated blasting areas.

D. Before the start of blasting work, submit for review a blasting plan containing details of proposed blasting and construction operations including the following:
1. Sequence and schedule of blasting rounds including the general sequence of drilling, blasting, excavating, and other related operations.
2. Specifics of typical trench blast rounds and open cut blast rounds in deepest rock cut areas and areas closest to existing structures.
3. Methods of matting or covering of the blast area to prevent flyrock and excessive airblast overpressure.
4. Name and qualifications of the licensed blaster who will be on site at all times directly supervising the loading and detonation of each blast round.
5. Details of an audible advance signal system to be employed at the job site as a means of informing workers, Owner, and the general public that a blast is about to occur.
6. Listing of instrumentation that the Contractor proposes to use to monitor vibrations and airblast overpressure levels complete with performance specifications and user's manuals supplied by the manufacturer.
E. The Contractor shall conduct all blasting activity in such a manner that the peak particle velocity of ground vibration measured at the locations of the nearest structures to the blast does not exceed the "safe limits" recommended by the U.S. Bureau of Mines in Appendix B of BUMINES RI 8507, as indicated on Attachment A. The Contractor shall conduct all blasting activity in such a manner that the peak airblast overpressure measured at the location of the nearest above ground occupied structures to the blast (considering wind direction) does not exceed 0.014 psi.

F. Blast monitoring shall be conducted by an independent, qualified engineering professional or seismologist trained in the use of a seismograph, and records shall be analyzed and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record. A minimum of two Architecting seismographs shall be used for each blast, one adjacent to the nearest off site structure from the blast; the other at a location mutually agreed upon by the Architect and Contractor.

G. Blast Monitoring Instrumentation: All instrumentation proposed for use on the project shall have been calibrated within the previous six months to a standard which is traceable to the National Bureau of Standards. Characteristics of required instrumentation shall comply with the following:
   1. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.
   2. Measure and display the maximum peak particle velocity component and airblast overpressure. These readings shall be displayed and be able to be read in the field, immediately after each blast.
   3. Furnish a permanent time history record of particle velocity waveforms and airblast overpressure waveforms, so that frequency and time of maximum peak particle velocity or airblast overpressure can be determined.

H. Blast Monitoring Reports: Within 24 hours following each blast, the Contractor shall submit to the Architect a Blast Monitoring Report. Each Blast Monitoring Report shall include all of the following applicable items:
   1. Blast round design data.
   2. Blast Monitoring Location Plan, indicating the location of the blast, the monitoring locations, and the distances from the blast to monitoring locations.
   3. Vibration and airblast overpressure data from each seismograph, including a copy of the strip chart (or other permanent record of velocity/time waveform) with calibration and monitoring record marked with the date, time and location of the blast.

I. Review by the Architect of blast designs and techniques shall not relieve the Contractor of his responsibility for the accuracy, adequacy and safety of the blasting, exercising proper supervision and field judgement and producing the results within the blasting limits required by these Specifications.

J. Blasting shall be limited to between the hours of 9:00 AM and 4:00 PM, Monday through Friday.

K. Blasting mats shall be utilized for all blast rounds detonated to prevent the throw of flyrock from the blasting area, unless the Contractor's Independent Seismologist determines that the overburden is sufficient to prevent flyrock.
3.5 EXCAVATION, GENERAL

A. Stability of Excavations:

1. Slope sides of excavations to comply with OSHA regulations and local codes. Shore and brace where sloping is not possible because of space restrictions or stability to material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

C. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

   a. 24 inches (600 mm) outside of concrete forms other than at footings.
   b. 12 inches (300 mm) outside of concrete forms at footings.
   c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches (150 mm) beneath bottom of concrete slabs on grade.
   f. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3. Rock excavation includes removal and replacement with approved materials. Excavated rock shall be reused on-site, when in compliance with this specification. This may include on-site crushing.

   a. Contractor shall uncover and expose all rock surfaces to be removed.
   b. Contractor shall notify owner in writing prior to proceeding with rock removal.
c. The Owner shall engage such professionals to determine the quantity of rock for payment, measurements for payment will be based on in place cubic yards to rock remove to paylines, as defined:

1) For Walls or Piers with Footings: The measurements will be taken horizontally parallel to and 24 inches outside of the edges of the concrete footings and vertically 24 inches below bottom of footing elevation as indicated in the Contract Documents.

2) For Walls or Piers without Footings: The measurements will be taken horizontally parallel to and 24 inches outside of the edges of the concrete limits and vertically 24 inches below bottom of concrete elevation as indicated in the Contract Documents.

3) For Slabs-on-Grade: The measurement will be taken vertically 60 inches below slab subgrade elevation as indicated in the Contract Documents.

4) Paved and Landscaped Areas: The measurement will be taken vertically 24 inches below finished surface elevation as indicated in the Contract Documents.

5) For Utility Trenches: The measurement will be taken vertically 6 inches below bottom of pipe and horizontally 24 inches wider than the nominal diameter of pipe/conduit as indicated in the Contract Documents.

6) For Tanks, Vaults, Manholes, Pits, Etc.: The measurement will be taken horizontally 24 inches greater in both length and width or diameter than the actual exterior dimensions of the structures and vertically 12 inches below the bottom elevation of structure as indicated in the Contract Documents.

d. Owner and Contractor shall agree on quantity of rock removal based on the above paylimits prior to mass rock removal.

e. No payment will be made for overblasted rock and/or shattered layers below paylimits, associated removal and replacement with suitable fill material.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Subgrade for Slabs on Grade:

1. Slabs on grade shall be supported on subbase/base course(s) as indicated on the drawings.

2. Remove and replace excessively wet, disturbed or unstable material and proof compact the subgrade for the slab subbase/base course with at least six passes of a vibratory plate or vibratory roller compactor immediately prior to placement of slab base course material unless otherwise directed.

3. The final surface of the subgrade for the moisture retarder membrane and/or slabs on grade shall be proof rolled with at least four passes of an approved vibratory plate or
vibratory drum compactor immediately prior to placing the membrane, reinforcing or concrete (as may be applicable).

3.7 EXCAVATION FOR PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

B. Saw cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the work.

C. Use shoring and bracing where sides of excavation will not stand without undermining pavement.

3.8 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit or as indicated.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.9 SUBGRADE INSPECTION

A. Notify Architect, Geotechnical Engineer and Owner’s agent when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed and in accordance with Article “Excavation for Structures” of this section.

C. Proof roll subgrade as directed by the Geotechnical Engineer and/or owner’s agent.

D. Authorized Additional Excavation: In the case that unsuitable materials, as determined by the engineer, are encountered at the specified subgrade elevation, the engineer may direct the removal of the unsuitable material and refill with granular fill placed and compacted in
accordance with the requirements of this Section. This work will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Unauthorized Excavation: Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the engineer or owner’s agent. Unauthorized excavation, as well as remedial work specified by the engineer, shall be at the Contractor’s expense.

1. In areas below pavements and walks, backfill unauthorized excavation with granular fill placed and compacted in accordance with this Section, unless otherwise directed by the engineer.
2. Elsewhere, backfill and compact unauthorized excavations with general fill, compacted to the requirements of this Section.
3. Where the excavation of otherwise suitable materials is required due to these materials being rendered unsuitable due to disturbance, construction activity, freezing or lack of protection from the elements, the Contractor shall excavate these materials and provide remedial work as specified above at no additional cost to the owner.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

A. Backfilling Prior to Acceptance of Work Installed:

1. Do not allow or cause the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests and acceptances.
2. Should any of the work be so enclosed or covered up before it has been accepted, uncover all such work at no additional cost to the owner.
3. After the work has been completed, tested, inspected and accepted, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the owner.

B. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage and insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

C. Place backfill on subgrades free of mud, frost, snow, or ice.

D. Unless otherwise specified or indicated on the drawings, the products specified in Part 2 of this Section shall be employed in the various fill and backfill applications indicated in that part. Place and compact fill material in layers to required elevations as follows:
1. Under utilities, use either bedding material or crushed stone (see drawings).
2. Under equipment pads, use crushed stone.
3. Under grass and planted areas, use general fill
4. Under walks and pavements, use base and subbase material

E. All vegetation, peat, organic topsoil or subsoil, trash, debris, roots, stumps, and any compressible or otherwise deleterious materials shall be stripped from the existing ground surface and removed from excavations prior to placement of fill or backfill.

F. All fill and backfill materials shall be placed in horizontal layers. Each layer shall be spread evenly and thoroughly mixed during spreading to ensure uniformity of material in each layer. Layer thickness shall not exceed that specified or indicated.

G. Where horizontal fill layers meet a natural or excavated slope, the layer shall be keyed into the slope by cutting a bench. The surface of benches shall be compacted to the same requirements as apply to the area being filled.

H. In no instance place fill over materials that were permitted to freeze prior to compaction or over ice or snow. Removal of such materials will be required as directed by the engineer. In no case will frozen material be allowed for use in fill or backfill.

I. No fill shall be placed or compacted during unfavorable weather conditions. When work is interrupted by heavy rains or snow, fill operations shall not be resumed until the moisture content and density of previously placed fill are as specified hereinafter.

3.13 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill under all existing utility pipes crossed during construction operations with \( \frac{3}{4} \) inch crushed stone. Crushed stone backfill shall extend continuously from the bedding of new utility pipes to the utility pipe crossed, including a 6 inch thick envelope of crushed stone all around the existing utility pipes. Crushed stone backfill shall stand at its own angle of repose. No “haunching” or “forming” with common fill will be allowed.
D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

E. Electrical and Telecommunications Conduit:
   1. Electrical Conduits: Bury beneath finish grade a minimum of 30 inches to top of conduit, or as required by the National Electrical Code or local utility company, whichever is deeper. Surround conduits by a minimum of 6 inches of sand or bedding material.
   2. Telephone and Communication Conduits: Bury beneath finish grade a minimum of 30 inches to top of conduit, or as required by the local utility company, whichever is deeper. Surround conduits by a minimum of 6 inches of sand or bedding material.

F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

I. Coordinate backfilling with utilities testing.

3.14 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 SOIL MOISTURE CONTROL

A. Moisture Control:
   1. Water shall be added to fill material which does not contain sufficient moisture to be compacted to the specified densities. Fill and backfill material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than two percentage points above optimum except that material which displays pronounced elasticity or deformation underfoot or under load shall be required to dry to optimum moisture content before it is placed and compacted, if that is required to achieve specified compaction. At the Contractor’s option, material which is too wet may be removed and replaced with satisfactory material at no additional cost to the owner.
   2. The Contractor is alerted to the potential silty nature of the onsite soil which renders them sensitive to moisture. Onsite silty soils are difficult to handle and compact and are easily
disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the onsite materials.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Allow the geotechnical engineer sufficient time to make necessary observations and tests. The degree of compaction shall be based on a maximum dry density as determined by ASTM Standard D1557 or AASHTO Standard T180. All fill and backfill placed in various areas shall be compacted in individual layers to minimum dry densities as follows:

2. Beside site retaining walls or tank walls: 95 percent
3. Top 2 feet under pavement: 95 percent
4. Below top 2 feet under pavement: 92 percent
5. Trenches through paved areas, top 2 feet: 95 percent
6. Trenches through paved areas, below top 2 feet: 92 percent
7. Trenches through unpaved areas: 92 percent
8. Embankments: 92 percent
9. Pipe Bedding: 92 percent
10. Under pipes through structural fills: 92 percent
11. Underdrain filter sand: 92 percent
12. Sand bedding for conduit: 95 percent
13. Grass and mulch areas: 90 percent
14. Uniformly graded crushed stone materials which are not suited to field density testing shall be compacted in accordance with the minimum compactive effort indicated in this Section.

D. The term "under," as applied to building, structures and paved areas, shall be construed to include all materials immediately below the plan area of the building, as well as those materials within a line sloping at one vertical to one horizontal drawn downward and outward from the exterior of building foundation, structure foundation or paved area.

E. Compaction shall be by mechanical means designed specifically for compaction and approved by the engineer. The engineer reserves the right to disapprove any device or inadequate capacity or of type unsuited to the character of the material being compacted. In areas which are too restricted to permit the use of mechanical compactors, fill may be placed in 3 inch layers and compacted by hand rammer or pneumatic tools.

F. In addition to the stated degree of compaction, all fill and backfill shall receive at least the compactive effort given in the following table. Lift thickness shall not exceed that shown for the compaction method selected, except that the first lift of fill or backfill placed over natural
ground in wet conditions may be as much as 12 inches thick. Application of the minimum compactive effort does not relieve the contractor from his requirement to achieve the specified degree of compaction.

<table>
<thead>
<tr>
<th>Compaction Method</th>
<th>Maximum Stone Size</th>
<th>Maximum Loose Lift Thickness</th>
<th>Maximum Loose Lift Thickness</th>
<th>Minimum Number of Passes</th>
<th>Minimum Number of Passes</th>
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<tbody>
<tr>
<td>Below Structures and Pavement</td>
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<td>Less Critical Areas</td>
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<td>Below Structures and Pavement</td>
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<td>Less Critical Areas</td>
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<tr>
<td>Hand-operated vibratory plate or light roller in</td>
<td>3”</td>
<td>6”</td>
<td>8”</td>
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<td>4</td>
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<td>confined areas</td>
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<td>Hand-operated vibratory drum rollers weighting at least</td>
<td>6”</td>
<td>8”</td>
<td>10”</td>
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<td>1,000 lbs</td>
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<tr>
<td>Hand-operated vibratory drum rollers weighting at least</td>
<td>6”</td>
<td>8”</td>
<td>14”</td>
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<td>3,000 lbs</td>
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<tr>
<td>Hand-operated vibratory drum rollers weighting at least</td>
<td>6”</td>
<td>8”</td>
<td>18”</td>
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<td>5,000 lbs</td>
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<tr>
<td>Hand-operated vibratory drum rollers weighting at least</td>
<td>6”</td>
<td>8”</td>
<td>24”</td>
<td>6</td>
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<tr>
<td>8,000 lbs</td>
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</table>

G. Where the engineer determines that fill or backfill does not conform to the compacted density specified, or did not receive the minimum compactive effort specified, such fill shall be removed and replaced with conforming materials at the Contractor's own cost.

H. Backfilling of Walls:

1. Do not backfill against walls until completion of slabs on grade, structural framing and suspended slabs which provide lateral support to these walls. In placing backfill, take special care to prevent any wedge action, eccentric loading or overloading by equipment used in backfilling and compaction. See Contract Documents for additional requirements.
2. Do not use equipment weighing more than 5,000 lbs. within 10 feet of all walls. Equipment weighing more than 5,000 lbs. shall not be used adjacent to walls, except as expressly approved by the engineer.

3. Backfill shall be placed concurrently on all sides of shafts, tunnel, and freestanding walls, each lift being compacted on all sides before successive lifts are placed. See Contract Documents for additional requirements.

4. Prevent damage to wall waterproofing or dampproofing when backfilling.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Maintenance:

1. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
2. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.18 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage
backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.19 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase and base course to required crown elevations and cross-slope grades.
3. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than the specified compaction of soil backfills and fills requirements.

3.20 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.21 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in place density of compacted fill complies with requirements.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

1. Field in place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.

2. When field in place density tests are performed using nuclear methods, make calibration checks for both density and moisture gages at the beginning of work, on each different type of material encountered and at intervals as directed by the engineer.

3. Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests along a wall face.

4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

5. Pavement areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner’s property.

3.24 TEST PITS

A. This work shall consist of excavating and back filling test holes to locate existing utilities at locations shown on the plans or as directed by the Resident.

B. The work shall be done in a manner that provides safe passage of the traveling public at all times. Coordination with the utilities is required prior and during the test pit activities. An authorized representative from the utility shall be present during the test pit activity. Test pits shall be completed in a manner that does not damage any utilities. Any damage to utilities or other roadway features by the test pit operations shall be repaired by the Contractor at no additional cost and shall be to the Resident’s satisfaction.

C. The Contractor shall coordinate with the City and design engineer on locating the utilities once exposed.

D. Once the location work is complete, the Contractor shall backfill the hole, place gravel and pavement over the test pits in a manner consistent with the existing conditions and in accordance with the standard specifications for backfilling.

END OF SECTION 312000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The Work of this Section is integral with the whole of the Contract Documents and is not intended to be interpreted outside that context.

C. Erosion control narrative and details shown on the project plans.


1.2 SUMMARY

A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the Work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.

B. This Section includes but may not be limited to the following:

   1. Temporary and permanent erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
   2. Inspection, repair, and maintenance of erosion and sedimentation control measures during construction until permanent vegetation has been established.
   3. Removal of erosion and sedimentation controls and restoration and stabilization of areas disturbed during removal.

C. Related Sections include the following:

   1. Section 312000 "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. MDOT: Maine Department of Transportation.

B. MDEP: Maine Department of Environmental Protection.
1.4 PERFORMANCE REQUIREMENTS

A. Environmental Licensing Requirements: All construction is subject to review and/or inspection by local, State, and Federal agencies for adequacy of erosion and sedimentation control measures. Take necessary steps to prevent soil erosion. Refer to publications of the Maine DEP (MDEP) and the Maine Soil and Water Conservation Commission for additional prevention measures to stop soil erosion and follow MDEP "Best Management Practices."


1.5 SUBMITTALS

A. Product Data: For each manufactured product indicated. Include manufacturer's instructions for installation.

B. Provide to the Engineer, in writing, a time schedule outlining the sequence of construction for site Work.

1.6 SEQUENCING AND SCHEDULING

A. Conduct operations in conformity with all Federal and State permit requirements. Plan the sequence of construction so that the smallest practical area of land is exposed at any one time during construction. Schedule the Work such that sedimentation barriers are installed early in the construction sequence, to prevent sediments from uphill areas reaching streams, wetlands, or property lines.

B. Provide to the Engineer, in writing, a time schedule outlining the sequence of construction for site Work.

C. See Plans for erosion and sedimentation control requirements.

D. See plans for fall and winter (September 15 or Later) stabilization requirements.

E. Stabilize exposed soils throughout the project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed, Fertilizer and Lime: Shall be as specified under Erosion Control Notes on Drawings.

B. Mulch: Comply with the requirements of MDOT Standard Specification, Section 619.

C. Erosion Control Mesh: North American Green DS150 blanket conforming to MDOT Standard Specification, Section 613 or as approved by the Engineer.
D. Siltation Fence (Filter Barrier):
   1. Support Fence: 30 inch high livestock fence, or high strength plastic mesh.
   2. Post: Rolled steel manufactured line post or 2 inch diameter hardwood post, 4.5 feet in length.
   4. Pre-manufactured Silt Fencing systems: Separate support fence may be eliminated if fabric is manufactured with reinforcement, including top cord.

E. Crushed Stone: Durable, clean, angular rock fragments obtained by breaking and crushing rock material; 2 to 3-inch stone.
   1. Stone for Stabilized Construction Exit and Check Dams: As indicated in the drawings.

F. Filter Fabric: Woven fabric composed of high-tenacity polypropylene yarns for sediment riser pipes and block and stone catch basin inlet traps.

G. Erosion Control Mix: Mix may be manufactured on or off project site.
   1. Mix shall consist primarily of organic material, separated at the point of generation, and may include shredded bark, stump grindings, composted bark, or flume grit and fragmented wood generated from water-flume log handling systems.
      a. Wood chips, ground construction debris, reprocessed wood products, or bark chips shall not be acceptable as the organic component of the mix.
   2. Mix shall contain well-graded mixture of particle sizes and may contain rocks less than 4 inches in diameter. Mix shall be free of refuse, physical contaminants, and material toxic to plant growth.
   3. Mix composition shall meet the following standards:
      a. Organic matter content shall be between 20 and 100 percent, dry weight basis.
      b. Particle size by weight shall be 100 percent passing a 6-inch screen, and a minimum of 70 percent and a maximum of 85 percent passing a 0.75-inch screen.
      c. Organic portion shall be fibrous and elongated.
      d. Large portions of silts, clays or fine sands are not acceptable in the mix.
      e. Soluble salts content shall be less than 4.0 mmhos/cm.
      f. Mix pH shall fall between 5.0 and 8.0.

H. Hay Bales: Bales shall be at least 14" x 18" x 30" in size, staked twice per bale. Stakes shall be 1" x 1" x 36" wooden. Place bales with twine on sides of bale, not top and bottom.

I. Water, calcium chloride, or crushed stone for prevention of airborne dust.

J. Siltsack: As indicated on the drawings.

K. Dirtbag: As indicated on the drawings.
PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Prior to grubbing, stripping, excavation, placement of fill, temporary or permanent placement of excavated materials, or other earthwork, the Contactor shall implement erosion and sedimentation control measures as specified herein and indicated on the plans.

B. A silt fence, filter berm, or stone sediment dam shall be installed along the down-slope side of the construction site, as necessary, to prevent soil sediment migration away from the site. Install silt fence or filter berm along the down-slope side of all top-soil and subsoil stockpiles.

C. Temporary measures for controlling erosion and sedimentation may include, but are not limited to, the following:
   1. Siltation fencing around the downslope periphery of areas to be disturbed by construction.
   2. Filter Berm around the downslope periphery of areas to be disturbed by construction.
   3. Temporary seeding and mulching of soil stockpiles or disturbed areas.
   4. Temporary sedimentation basins, siltation traps, stone check dams and other temporary practices as approved by the Engineer.

D. Permanent measures for controlling erosion and sedimentation shall be provided as shown on the drawings or required by these Specifications.

E. Where disturbed areas cannot be permanently stabilized within 14 days of exposure of the soil, the areas shall be temporarily seeded and mulched, or otherwise stabilized as approved by the Engineer.

F. Permanent soil stabilization measures for all slopes, channels, ditches, or any disturbed land area shall be completed within 7 calendar days after final grading has been completed. Where such permanent erosion control measures are not possible or practical to implement, and upon approval by the Engineer, temporary stabilization practices shall be applied as in 3.1.C above.

G. All temporary and permanent control measures shall be periodically inspected and maintained by the Contractor for the duration of the construction and warranty period of this Contract. Sediment collection devices shall be cleaned periodically as required, and the removed material reused or disposed of at an approved disposal area.

3.2 SURFACE WATER DIVERSION

A. Build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protection Works needed to divert streamflow and other surface water through or around the construction site and away from the construction Work while construction is in progress.

B. Outlet diverted stormwater and water from excavations to sedimentation trap or basin or other approved sedimentation control measure.
3.3 SILTATION FENCE (FILTER BARRIER)

A. Construct siltation fences at the locations and to the dimensions indicated, and as required to meet specified criteria.

B. Set fence post 6 feet O.C. to a depth of 2 feet. Attach support fence to post with fencing staples or appropriate wire ties.

C. Overlap joints in support fence 12 inches. Apply fabric to full height of support fence and secure to prevent sagging, blow off, and loss. A 12-inch overlap of fabric for vertical piecing shall be maintained, folded to a 3 inch width and securely attached to supports.

D. No horizontal joints will be allowed.

E. The bottom of the fabric shall be trenched into the existing ground a minimum of 6 inches. In addition, hay bales or ditch checks shall be installed along the silt fence to create sedimentation pools in low areas where run-off concentrates.

F. Prior to removal of the silt fence, all retained soil or other material shall be removed and disposed of at an approved disposal area.

3.4 FILTER BERM

A. Place un-compacted erosion control mix in a windrow at locations shown on the plan or as directed by the Engineer.

1. At a minimum the berm shall be 3 feet wide at the base and 2 feet high at the center of all points along its length.

2. Berm material, where the berm is still required, which has decomposed, clogged with sediment, eroded, or becomes ineffective, shall be replaced.

3. The berm shall be removed from the site when no longer required, as determined by the Engineer.

3.5 TEMPORARY SEEDING AND MULCHING

A. Topsoil stripped and stockpiled on site shall be immediately seeded with erosion control seed mix and mulched with hay.

B. Exposed earthwork areas, which will not be worked on for one week, shall be hay mulched. Unfinished areas which are not to be worked on for one month, or will be wintered, shall be seeded with erosion control mix at a rate of 4 pounds of seed per 1000 sq. ft. and mulched with hay. Apply hay mulch at the rate of 3 tons per acre such that no soil is exposed. Anchor mulch to prevent wind blown movement.

C. In sensitive areas (within 25 ft. of stream or wetland edge) temporary mulch must be applies within 7 days of initial disturbance and prior to any storm event.

D. Winter Mulch: If the catch of grass is less than 75% by November 15, apply additional hay mulch to achieve a protective layer of 5 tons per acre. Anchor mulch with mesh to prevent wind blown movement.
E. No fill shall be placed on hay mulch. Dispose of used hay mulch off site.

3.6 FALL AND WINTER STABILIZATION

A. Stabilize exposed soils throughout the project site with permanent seed and mulch by September 15, with the exception of areas undergoing active earthmoving operations. These construction areas are primarily in the immediate vicinity of the building. For proposed grass areas not stabilized by permanent seed and mulch by this date, provide the following stabilization measures at no additional cost to the Owner. Select the appropriate methods from the options listed and obtain approval from the Engineer prior to installation.

1. Stabilize the soil with temporary vegetation, except for ditches, by October 1. Place winter rye seed at the rate of 3 pounds per 1000 sq. ft. and lightly much with hay or straw at 75 pounds per 1000 sq. ft. Place erosion control mesh over mulch and anchor.
2. For slopes flatter than 3H:1V, place sod over the exposed soil by October 1. Roll the sod, anchor it with wire pins, and water it to promote growth.
3. For grassed areas flatter than 10H:1V, stabilize the disturbed soil by November 1 with temporary winter mulching by applying hay or straw at a rate of at least 150 pounds per 1000 sq. ft., such that no soil is visible through the mulch. Anchor mulch with erosion control mesh.
4. For slopes steeper than 10H:1V and flatter than 2H:1V, place a 6" layer of erosion control soil/bark mix on the disturbed soil by November 1. Remove snow accumulated on the slope prior to installation. If groundwater seeps are present, place stone rip rap to thickness shown on drawing details over non-woven geotextile.
5. For drainage ditches or channels, place a sod lining by October 1 or place a rip rap lining by November 1. Sod shall be rolled, fastened with wire pins, anchored with erosion control mesh, and watered. Rip rap shall be placed at the thickness shown on the drawing details over a layer of non-woven geotextile.

B. If the catch of permanent or temporary grass is less than 3" tall or covers less than 75% of the disturbed soil by November 1, apply additional hay mulch at a rate of 150 pounds per 1000 sq. ft. Anchor mulch with erosion control mesh.

3.7 DRAINAGE DITCHES AND EMBANKMENTS

A. Drainage ditches shall be provided with filter berm silt dams or rock check dams spaced no greater than 100 feet apart.

1. Temporary ditch dams shall be constructed where indicated, using composted bark soil mix or rocks in the configurations shown. Additional temporary ditch dams shall be installed from time to time during the construction where necessary to prevent soil particle migration from the work area. Where necessary due to terrain configuration, earth berms shall be constructed at one or both ends of the ditch check so as to contain runoff. The tops of earth berms shall be higher than the tops of the dams so that runoff will occur only over the dams. Sand bags may be used instead of earth berms at the Contractor's option but shall be faced with earth placed against the upstream face.
B. Grassed drainage ditches and swales shall be lined with a continuous matt of erosion control mesh for full bottom width and side slopes to 12" above bottom, to stabilize the loam, seed and mulch.

C. Where erosive velocities in ditches or embankments are anticipated or experienced, and soil cannot be stabilized with mulch and mesh alone, substitute erosion control soil mix in place of loam. For this use, screen erosion control soil mix to remove wood, bark, and stones one-inch in size and greater. If erosion control soil/bark mix is used in ditches, and erosive velocities are excessive, provide a 12" thick stone rip rap lining along ditch bottom and up side slopes to one foot above the bottom elevation. Place non-woven geotextile beneath stone.

D. Stabilize pond embankments (interior and exterior), slopes steeper than 3 horizontal to 1 vertical (33%), and drainage ditches by September 15. Stabilization shall consist of permanent seeding and mulch, temporary winter seeding (winter rye) and winter mulch. If this date cannot be met, provide alternative permanent or temporary stabilization described as Fall and Winter Stabilization.

E. Install erosion control mesh over mulch on slopes steeper than six horizontal to one vertical (16%) and in conformance to DOT Standard Specifications, latest Edition, paragraphs 613.03 through 613.05. Anchor mesh as recommended by manufacturer.

F. Permanently rip-rap inlets and outlets of culverts and pipe outfalls as specified in Section 312000“Earth Moving”, and as shown on the Drawings.

G. Install permanent erosion control blanket around culvert inlets and outlets as shown on the Drawings, and according to manufacturer’s recommendations.
1. Prepare soil with loam, fertilizer, and seed as specified in Section 329300 “Landscape Work” prior to installing erosion control blanket.
2. Install permanent erosion control blanket 5 feet minimum in all directions around culvert inlets.
3. Install permanent erosion control blanket 5 feet minimum in all directions around culvert outlets, and a 6 feet width centered along the outlet channel for 10 feet.
4. Install staples as shown on the erosion control blanket detail on the Drawings, and throughout the blanket in an 18 by 18 inch grid.

3.8 INSTALLATION OF RIPRAP

A. Construct riprap (riprap outlet protection) at the locations and to the dimensions indicated.

B. Clear and grub the surface of all areas where riprap aprons will be constructed. Dispose of unsatisfactory material at designated disposal areas.

C. There shall be no overfall from the end of the apron to the surface of the receiving channel. The area to be riprapped shall be at the same grade (flush) with the surface of the receiving channel.

D. Apron dimensions and riprap thickness shall be as indicated.

E. Placing of fill in the receiving channel shall not be allowed.
3.9 EROSION CONTROL MIX-MULCH

A. Apply mix of the following thicknesses based on length and steepness of slope:

1. On Slopes of 3:1 or Less: 2 inches plus an additional 1/2-inch per 20 feet of slope up to 100 feet.
2. On Slopes Between 3:1 and 2:1: 4 inches plus an additional 1/2-inch per 20 feet of slope up to 100 feet.
3. The thickness of the mulch at the bottom of the slope shall be as follows:

   a. Less Than 3:1 Slope Slopes Between 3:1 and 2:1
   b. Less than 20 Feet of Slope: 2.0 inches 4.0 inches
   c. Less than 60 Feet of Slope: 2.5 inches 5.0 inches
   d. Less than 100 Feet of Slope: 3.0 inches 6.0 inches

3.10 DUST CONTROL

A. Provide dust control measures to prevent off-site damage, health hazard to humans, wildlife and plant life, or become a traffic safety hazard.

B. To the maximum extent as is practicable

1. Use traffic control to restrict traffic to predetermined routes.
2. Maintain as much natural vegetation as possible.
3. Use phasing of construction to reduce the area of land disturbed at any one time.
4. Use temporary mulching, permanent mulching, temporary vegetative cover, permanent vegetative cover, or seeding to reduce the need for dust control.
5. Use mechanical sweepers on paved surfaces where necessary to prevent dust buildup.
6. Stationary sources of dust, such as rock crushers, shall utilize fine water sprays to control dust.

C. Moisten exposed soil surface periodically with adequate water to control dust.

D. Where other methods are not practical, use of calcium chloride will be permitted. Spreader at a rate that will keep surface moist but not cause pollution or plant damage. To reduce potential for environmental degradation, use only when other methods are not practical. In areas adjacent to waterways and sensitive environmental areas, verify materials and procedures with governing authority.

E. Cover surface with crushed stone or coarse gravel. In areas adjacent to waterways, use chemically stable aggregate.

F. When temporary dust control measures are used, repetitive treatment shall be applied as needed to accomplish control.

3.11 CONSTRUCTION DEWATERING

A. Water from construction dewatering operations shall be cleaned of sediment before reaching wetlands, water bodies, streams, or site boundaries. Utilize temporary sediment basins, erosion
control soil filter berms, silt fencing, block and gravel catch basin inlet protection, or other approved Best Management Practices (BMPS).

B. In sensitive areas, near streams or ponds, discharge the water from the de-watering operation into a temporary sediment basin created by a surrounding filter berm of uncompacted erosion control soil mix. Locate the temporary sediment basin at least 100 feet from the nearest water body, such that the filtered water will flow through undisturbed vegetated soil areas prior to reaching the water body or property line.

3.12 ADDITIONAL MEASURES

A. Areas outside the Contract Work limits shall be protected from lubricants, fuel, sediment and other pollutants.

B. Catch basin inlets in gravel or paved areas shall be surrounded by a sediment barrier of hollow concrete blocks 12" to 24" high covered with wire mesh of 1/4" opening. Pile well graded crushed stone of 1/2" to 2" stone size around the mesh to the top of the blocks.

C. Catch basin inlets in grassed areas shall be protected by hay bales or block and gravel sediment filter until permanent soil stabilization has been achieved.

D. Inspect erosion and sedimentation control weekly and after every storm and maintain in good working condition for project duration.

3.13 REMOVAL AND DISPOSAL

A. After permanent soil stabilization has been achieved, temporary materials and devices that are not readily degradable shall be removed and disposed of offsite. Silt fences, filter berms, and catch basin sediment filters shall be fully removed.

B. Repair areas disturbed by temporary materials and removal operations to match surrounding finished surfaces. At natural vegetation areas to remain, restore to match existing conditions.

END OF SECTION 312500
PART 1- GENERAL: Purchase and install the equipment, materials and devices necessary to provide the UMaine Darling Marine Lab with a new seawater system that provides up to 600 gpm of ambient seawater to their FSL and MCL for additional seawater processing as specified herein.

1.1 PROVISIONS INCLUDED

A. Include General Conditions, Supplementary General Conditions Division 0 and applicable parts of Division 1 for conditions and Section 019110 Commissioning and requirements which may affect the work of this Section.

B. Examine all other Sections of the specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other Trades affecting, or affected by work of this Section. Cooperate with such Trades to ensure the steady progress of all work under the Contract.

D. Reference Drawings: The Work of this Section is shown on the following Contract Drawings:

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1.2 DEFINITIONS

A. Words in the singular shall also mean and include the plural, wherever the context so indicates and words in the plural shall mean the singular, wherever the context so indicates.

B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

C. Wherever the term "provide" is used in the specifications it will mean "furnish and install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the specifications.

D. Wherever the term "material" is used in the specifications it will mean any product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.

E. The terms "approved", or "approval" shall mean the written approval of The Engineer.

F. The term "specification" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.

G. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed" and similar words shall mean the direction, requirement, permission, order, designation or prescription of The Engineer. The terms "approved", "acceptable", "satisfactory" and similar words shall mean approved by, acceptable or satisfactory to The Engineer.

H. The terms "necessary", "reasonable", "proper", "correct" and similar words shall mean necessary, reasonable, proper or correct in the judgment of The Engineer.

I. "Piping" includes in addition to pipe or mains, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.

J. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

K. "Exposed" means not installed underground or "concealed" as defined above.

L. "Invert Elevation" means the elevation of the inside bottom of the pipe.

M. "Commissioning Agent (CA)" shall refer to the party employed by the Owner to witness the demonstration of all systems according to the commissioning plan. Refer to Section 019110.

N. "Construction Manager" shall refer to the Construction Manager (CM) for this project.
1.3 “Seawater System Contractor” shall refer to the company contracted specifically to furnish and install the seawater system.

1.4 The ‘Seawater System Piping Contractor” is equivalent to the “Seawater System Contractor”

1.5 “Seawater Process Control Contractor” shall refer to the company subcontracted by the “Seawater System Contractor” to furnish the stated seawater sensors and control valves to the “Seawater Systems Contractor” for installation and to provide and install the Seawater Control Panel and VFD Cabinets. The Seawater Process Control Contractor shall be responsible for writing and furnishing the Seawater Control Program to operate and control the entire seawater water system.

1.6 The “Seawater System Integrator” is equivalent to the “Seawater Process Control Contractor”

1.7 CODES, STANDARDS AND REFERENCES

A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.

B. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Contractor, as applicable, shall promptly notify The Engineer in writing of any such difference.

C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities Having Jurisdiction, the most stringent requirements of the aforementioned shall govern for budgetary purposes. However, no work will proceed until The Engineer determines the correct method of installation.

D. Should any Contractor, as applicable, perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by The Engineer.

E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations and the applicable requirements of the following accepted Codes and Standards, without limiting the number, as follows:

1. State of Maine Plumbing Code
4. Environmental Protection Agency (EPA)
5. State of Maine Fire Prevention Regulations and Elevator Regulations
6. Local Ordinances, Regulations of the Local Building Department and Fire Department
7. National Electrical Code (NEC)
8. Recommendations of ASPE (American Society of Plumbing Engineers)
a. NFPA 30 Flammable and Combustible Liquids Code
b. NFPA 101 Life Safety
c. NFPA 55 Compressed Gases and Cryogenic Fluids

10. Occupational Safety and Health Administration (OSHA)

F. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the accepted volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following bodies, as applicable:

1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. ASTM American Society of Testing Materials
4. CS Commercial Standards, U.S. Department of Commerce
5. FMG Factory Mutual Guidelines
7. MSS Manufacturers Standardization Society of the Valve and Fittings Industry
8. NEMA National Electrical Manufacturers Association
9. NFPA National Fire Protection Association
10. UL Underwriters’ Laboratories, Inc.
11. AWS American Welding Society

G. The Seawater System Contractor and Contractor for the work under their charge, shall give all necessary notices, obtain and pay for all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. The Seawater System Contractor shall obtain all required Certificates of Inspection for their work and deliver same to The Engineer before request for acceptance of their portion of work and before final payment is made.

H. All equipment shall be installed per manufacturer’s recommendations and requirements. The Seawater System Contractor and Contractor shall notify The Engineer in writing when they intend to deviate from manufacturer's installation guidelines. The Engineer shall advise if the installation is acceptable prior to installation.

1.8 RELATED SECTIONS

A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.
1.9 REGULATORY REQUIREMENTS

A. There are no regulatory requirements for the installation of a seawater system in a research laboratory.

1.10 SUBMITTALS

A. Provide six sets of a complete Submittal Package, including any Shop Drawings, Piping Diagrams, Seawater System Materials, Products, Equipment and Controls, all to be reviewed and approved by The Engineer before ordering any seawater system products or proceeding on the installation of the Seawater System or Process Control Components.

B. Documents submitted shall show the following:

1. Principal dimensions, and details of construction.
2. Operating and maintenance clearances.
3. Weights of principal parts and total weights with information required for the design of supports and foundations.
4. Sizes and location of piping and connections.
5. Performance data, including pump curves.
6. Data on electric motors, including brake horsepower of driven equipment, nameplate ratings and classes, sound data, starting and running full load currents, required starter size and recommended overload heater ratings.
7. Approval stamp of Underwriters’ Laboratory and other authorities having jurisdiction of Contract Drawings requiring such approval.
9. Minimum scale for equipment/mechanical rooms shall be 1/4 inch equal 1 foot.

C. Submit brochures that contain only that information which is relative to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless irrelevant information is marked out and relevant material is clearly marked.
D. Specifications Compliance Statement

1. The manufacturer shall submit a point by point statement of compliance with the specifications.
2. The statement of compliance shall consist of a list of all paragraphs (line by line).
3. Where the proposed system complies fully, such shall be indicated by placing the word “comply” opposite the paragraph number.
4. Where the proposed system does not comply, or accomplishes the stated function in a manner different from that described, a full description of the deviation shall be provided.
5. Where a full description of a deviation is not provided, it shall be assumed that the proposed system does not comply with the paragraph in question.
6. Submissions which do not include a point by point statement of compliance as specified shall be rejected.

1.11 GUARANTEE

A. Attention is directed to provisions of the General Requirements and Supplementary General Conditions regarding guarantees and warranties for work under this Contract.

B. Manufacturers shall provide their standard guarantees for work under this Contract, unless specified otherwise. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer, Construction Manager, and/or Seawater System Contractor may have by Law or by other provisions of the Contract Documents. In any case, such guarantees and warranties shall commence when the Owner accepts the various systems, as applicable and as determined by The Engineer. The guarantees and warranties will remain in effect for a minimum period of (1) year thereafter except where longer periods are specifically stated and specified.

C. All materials, items of equipment and workmanship furnished by the Seawater System Contractor shall carry the warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Seawater System Contractor responsible, including all other damage done to areas, materials and other systems resulting from this failure.

D. The Seawater System Contractor shall guarantee that all elements of the systems provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated on the drawings.

E. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Seawater System Contractor.

F. The Seawater System Contractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.
1.12 COMMISSIONING

A. The Seawater System Contractor must also include sufficient man-hours within their bids, for their participation with the Commissioning Team meetings and overall process and the rebalancing / re-adjusting / resetting all device set points, as described in Section 019110 - General Commissioning Requirements and Section 350800 Seawater System Commissioning Requirements.

B. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner’s operation and maintenance personnel, is required in cooperation with the Owner’s Representative and the Commissioning Agent. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Execution Requirements for substantial completion details. Refer to Section 019110 – General Commissioning Requirements and Section 350800 – Seawater System Commissioning Requirements.

1.13 THE SEAWATER SYSTEM CONTRACTOR

A. The Seawater System Contractor shall base his bid on site examinations performed by him. This requirement is mandatory. The Contractor shall visit the proposed site where work is scheduled to be performed and ascertain for himself the amount of work required to fulfill the intent of his Contract and the complexity of the installation. The Seawater System Contractor shall not hold The Engineer, his Consultants, agents or employees responsible for or bound by, any schedule, estimate or for any plan thereof. The Seawater System Contractor shall study all related Contract Documents (HVAC, Electrical, Architectural, Structural, Plumbing), etc., included under each Contract, to determine exactly the extent of work to be provided under each Section, and in installing new equipment and systems and coordinating the work with the other Trades and existing conditions.

B. The Seawater System Contractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications and shall take all responsibility for and bear all losses resulting to him in the execution of his work.

C. The Seawater System Contractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the Seawater System Contractor shall perform their work according to all the conditions as set forth in these specifications.

D. The Seawater System Contractor shall furnish all materials and perform all work in accordance with the project specifications and any supplementary documents provided by The Engineer. The work shall include every item shown on the drawings and/or required by the specifications as interpreted by The Engineer. All work and materials furnished and installed shall be new and of the best quality and workmanship. The Seawater System Contractor shall cooperate with The Engineer so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.
1.14 COORDINATION OF WORK

A. The Seawater System Contractor shall compare his drawings and specifications with those of other Trades and report any discrepancies between them to The Engineer and obtain from The Engineer written instructions for changes necessary in the mechanical or electrical work, to ensure that all work is installed in coordination and cooperation with other Trades installing interrelated work. Before installation, the Seawater System Contractor shall make proper provisions to avoid interferences in a manner approved by The Engineer. All changes required in the work of the Contractor caused by his negligence, shall be corrected by him at his own expense, to The Engineer's satisfaction.

B. Locations of piping and equipment shall be adjusted to accommodate the new work with interferences anticipated and encountered during installation. The Seawater System Contractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings will have to be completed to verify dimensions and characteristics of the various systems' installations.

C. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.

D. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Seawater System Contractor shall provide manual air vents and drains as required for his work to affect these offsets, transitions and changes in direction, as applicable.

E. All work shall be installed in a way to permit access (without damage to other parts) of valves, cleanouts, shock absorbers, traps and all other system components provided under this Contract requiring periodic replacement or maintenance. All piping shall be arranged in a manner to clear the openings of swinging overhead access doors, ceiling tiles and cleaning access doors in ductwork.

1. Access to any and all components requiring servicing, adjustment, calibration, maintenance or periodic replacement shall be provided so that the Owner's operations personnel can freely gain access without removal of any materials other than the access panel or ceiling tile. Access shall be understood to mean free, clear and unobstructed from the floor up to the device and/or component being serviced.

F. The Contract Drawings are diagrammatic only intending to show general runs and locations of piping, valves, equipment and specialties and not necessarily showing all required offsets, details and accessories and equipment to be connected.

1. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
G. Where discrepancies in scope of work as to what Trade provides items, such as starters, disconnects, flow switches, electric control components, etc., exist, such conflicts shall be reported to The Engineer prior to signing of the Contract. If such action is not taken, the Seawater System Contractor, as applicable, shall furnish such items as part of his work, for complete and operable systems and equipment, as determined by The Engineer.

H. Where drawing details, plans and/or specification requirements are in conflict and where pipe is shown to be different between plans and/or between plans and sections or details, the most stringent requirement will be included in the Contract. Seawater plumbing systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to The Engineer's attention for direction as to what is to be provided.

I. Final location of all fixtures and connections shall be coordinated with the Architect’s elevation plans and/or other Architectural details, as applicable. Offsets of piping, added fittings, valves, elbows, flexible connections, etc., shall be provided as required to comply with the Architectural and/or The Engineer floor plans, elevation plans and/or installation details. Obtain approval of locations of all devices from The Engineer in the field, prior to installation.

J. Equipment shown on the Seawater System or Architectural drawings to be provided with services, such as piping, traps, drains, valves, etc., shall be included under this Contract as applicable, including all piping connections to systems, to make equipment completely operable. Additional piping, valves, flexible fittings, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no additional cost to the Owner.

1.15 COORDINATION DRAWINGS

A. Before materials are purchased, fabricated or work is begun, the Contractor shall prepare coordination drawings in cooperation with all trades for all floors/areas, including buried systems/services (all-Trade-composite at 1/4" scale), showing the size and location of his equipment and lines, in the manner described herein under General Requirements. Any sections of difficult areas shown in the contract documents are for reference only and do not dictate how to layer or install the trades.

B. A detailed drawing schedule shall be produced to conform to the scale drawing requirements as herein listed and submitted for review. Coordination drawings are for the CM, Architects/Engineer, and The Engineer use during construction and shall not be construed as shop drawings or as replacing any shop drawings. The coordination drawings, when corrected for actual "as-built" conditions, will be reviewed by The Engineer, corrected and become the Record Drawings to be submitted to the Owner for his use.

C. The cost of producing and reproducing the drawings will be included under the Contract of each Trade. This process may include multiple revisions to these drawings which will be included in the cost.

The intent is to provide a fully coordinated set of documents between trades no matter how many times they may have to be redone. The Seawater System Contractor shall take the lead to produce the Architectural backgrounds, show all ductwork, piping, etc., and circulate the
D. In addition to the regular coordination drawing review, the plumbing work will also be reviewed by the Architect/Engineer and The Engineer to ensure that the system and equipment arrangements are suitable to provide maintenance access and service as follows:

1. Valves and instrumentation should be grouped where possible and positioned in accessible locations.

E. Prepare a complete set of computer-based drawings

1. Prepare a complete set of computer-based drawings.
2. Format shall be:
   a. AutoCAD 2016 or earlier
3. Scale not less than 1/4" scale equals 1'-0", showing basic layout for the structure and other information as needed for preparation of Coordination Drawings.
4. The drawings shall indicate the layout of all specialty tradework as indicated herein and shall be designated as Coordination Drawings.
5. Any drawing requirement to assist the contractor will require:
   a. A signed liability release form will be required from the Seawater System Contractor prior to the release of the disk from the Engineer.

F. Each of the specialty trades shall add its work to the base drawings with appropriate elevations and grid dimensions. Specialty trade information shall be required for mechanical rooms, crossovers and for spaces above ceilings where congestion of work may occur such as corridors and, where required, entire floors. Drawings shall indicate horizontal and vertical dimensions to avoid interference with structural framing, ceilings, partitions and other services. Indicate elevations relative to finish floor for bottom of piping. Sections shown in the contract drawings are diagrammatic only and all trades shall share and coordinate sectional views used.

1. Specialty Trade shall include:
   a. Plumbing system
   b. Seawater System
   c. HVAC piping and associated control systems
   d. Electrical
   e. Sheet metal work
   f. Fire protection system
   g. Automatic temperature control
   h. Fire alarm
   i. Security
   j. Telecommunications
   k. Pneumatic tube
   l. Commissioning Review and Comments
G. Upon completing their portion of the Coordination Drawings, each specialty trade shall sign, date and submit the Coordination Drawings to the CM, Architect/Engineer for review.

H. Where conflicts occur with placement of materials of various trades, the CM shall be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the affected specialty trade Contractor. The CM shall then final date and sign each drawing.

I. Fabrication of materials shall not start until Coordination Drawings have been signed, reviewed, and distributed to all parties as indicated herein.

J. Distribution of Coordination Drawings: (Modified for clarification)
   1. The CM shall provide one print of each Coordination Drawing to:
      a. Each specialty trade Subcontractor.
      b. Owner.
      c. General Contractor.
      d. Architect (for record purposes).
      e. Engineer.

K. After Distribution
   1. Resolve all interferences not previously identified.

L. Coordination Drawings shall include but are not necessarily limited to:
   1. Structure (Beams, cross bracing, columns, gusset plates, etc.).
   2. Partition/room layout, including indication of smoke and fire resistance rated partitions.
   3. Ceiling layout and heights.
   4. Light fixtures.
   5. Access panels.
   6. Sheet metal, heating coils, heat pumps, grilles, diffusers, duct flanges, and pipe hanger/supports and pipe support steel, guides, expansion compensators, kitchen exhaust access doors, and take-offs from the duct risers, etc.
   7. All heating piping and valves.
   8. All seawater system piping and equipment.
   9. Smoke and fire dampers including access doors.
  10. Soil, waste and vent piping.
  11. Primary water and gas pipes.
  12. Major electrical, fire alarm, and security conduit runs (All sizes) panelboards, feeder conduit and racks of branch conduit (All). Motor control centers, starters and disconnects including shaft coordination for larger conduit riser junction boxes to ensure access for JBs and JBs sized to access all cables, and access to splice cables.
  13. Sprinkler piping and heads.
  14. All equipment, including items in the Contract as well as Owner Furnished / Contractor Installed (O.F.C.I.) and Owner Furnished / Owner Installed (O.F.O.I.) items.
  15. Equipment located above finished ceiling requiring access for maintenance and service. In locations where acoustical lay-in ceilings occur indicate areas in which the required access area may be greater than the suspended grid systems.
16. Rainwater piping
17. Existing conditions and in-contract underground/foundation work, including but not limited to, Mechanical, Plumbing, Fire Protection and Electrical items.
18. ATC panels
19. Cable tray
20. Beam Penetrations

M. All shaft coordination drawings shall be detailed with the appropriate sizes for all ducts, HVAC pipe, conduits, fire protection piping & Plumbing waste, vent, water, gases, seawater, etc. Hanger support types, miscellaneous support steel shall be detailed to allow for proper clearances and appropriate insulation thickness. Shaft coordination drawings shall be submitted for review in plan and elevation views.

N. The Architect’s response to all requests for information (RFI’s) generated by the trade contractors shall be distributed to all other affected trades as if this information was contained in the original contract documents. In other words, the party that issues an RFI is responsible for distributing the information to all affected parties.

O. The Seawater System Contractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.

1.16 RECORD DRAWINGS

A. The Seawater System Contractor shall maintain, current at the site, a set of Contract Drawings for his portion of the work on which he shall accurately show the actual installation of all work provided under his Contract indicating any variation from the Contract Drawings, in accordance with the General Conditions and Supplementary General Conditions. Changes whether resulting from formal change orders, requests for information, or other instructions issued by the Architect and/or The Engineer shall be recorded. Include changes in sizes, location and dimensions of piping, equipment, etc.

B. The Seawater System Contractor shall indicate progress by coloring-in various pipes and associated appurtenances exactly as they are installed. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.

C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be reviewed periodically by the Architect, The Engineer, and Owner's representatives and they shall be corrected if found either inaccurate or incomplete. This procedure is mandatory. Marked up drawings shall include all flow diagrams, schedules, details and control diagrams.

D. The Seawater System Contractor shall meet at a minimum on a monthly basis, with the Owner's representative to transfer the information from his Plumbing marked-up and colored-up prints to a set which will become the basis for preparation of as-built drawings.
E. Upon completion of the project, each Contractor shall submit his marked-up drawings to the Architect for review and comment. After the Architect reviews and comments on this set of documents, each Contractor shall prepare as-built drawings on CAD. When the work is completed, each Contractor shall provide 2 hard copies to the Architect for submittal to the Owner and disks with all documentation and a set of reproducible drawing plots marked "As-Built" drawings. The Contractor shall bear all costs of producing the CAD "As-Built" drawings, providing all necessary drawing changes and printing the reproducible drawings for the work under his charge.

1.17 GIVING INFORMATION

A. The Seawater System Contractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the Architect and other Contractors [or Subcontractors] sufficiently in advance of the work so that all openings may be built in advance.

1.18 EQUIPMENT AND MATERIALS

A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect and The Engineer until installed. All items subject to moisture damage such as controls, motors, etc., shall be stored in dry, heated spaces.

B. The Seawater System Contractor shall have his equipment tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned, polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect and The Engineer. Damage or defects developing before acceptance of the work shall be made good at the Contractor's or his Subcontractor’s expense as applicable.

C. The Seawater System Contractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.

D. Manufacturers' directions shall be followed completely in the delivery, storage, protection and installation of any equipment. Promptly notify The Engineer in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions and obtain The Engineer's written instructions before proceeding with the work. Should any Contractor perform any work that does not comply with the manufacturer's directions or written instructions from The Engineer, he shall bear all costs to correct any deficiencies that should arise.

E. The Seawater System Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
F. Where equipment of the acceptable manufacturers requires different arrangement or connections from those shown, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect and/or The Engineer, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all necessary changes in all effected related work provided under other Sections including location of roughing-in connections by other Trades, electrical requirements, piping, supports, insulation, etc. All changes shall be made at no increase in the Contract amount or additional cost to the other Trades and/or Owner.

G. Testing Agency Labeling Requirements

1. All equipment and materials required for installation under these specifications shall be new and without blemish or defect.
2. Equipment and materials shall be products which will meet with the acceptance of the Authorities Having Jurisdiction over the work and as specified hereinbefore.
3. All equipment shall meet OSHA standards.
4. All products shall be listed and labeled by UL or other national testing laboratories such as ETL and the products shall be so labeled.
   a. Label of Underwriter’s Laboratories, ETL or other nationally recognized testing agency acceptable to the Authorities Having Jurisdiction.
   b. This Labeling shall include not just the control panel and/or motor but all wiring and devices included in the package as a complete package. Note: Providing a series of individually labeled electrical devices that are then assembled into a package does not meet this requirement, the whole assembly must be labeled as an assembly. The manufacturers have the option of having the equipment inspected and labeled at the factory or at the site after installation. This requirement shall supersede any other specification language hereinbefore or hereinafter that requires only portions of the equipment to be labeled.

H. All equipment of one type (such as valves, pumps, plumbing fixtures, etc.), shall be the product of one manufacturer.

I. Equipment prepurchased on behalf of the Owner or by the Owner himself, if assigned to any of the Contractors, shall be received, inspected, installed, etc., as if it was purchased by the Contractors as applicable. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.19 CUTTING AND PATCHING

A. The Seawater System Contractor shall be responsible for all core drilling, as required for work under his Contract, but in no case shall he cut into any structural elements without the written approval of the Architect.

B. All cutting, rough patching and finish patching, shall be coordinated and provided under this Contract.

C. All concrete and masonry equipment bases and pads shall be coordinated and provided under this Contract.
1.20 USE OF PREMISES

A. The Seawater System Contractor shall confine all of his apparatus, storage of materials and construction to the limits indicated on the drawings and directed by the Architect and he shall not encumber the premises with his materials.

B. In storing materials within areas (structure or ground), or when used as a shop, the Seawater System Contractor shall consult with the CM and shall restrict his storage to space designated for such purposes. The Seawater System Contractor will be held responsible for repairs, patching or cleaning arising from any unauthorized use of premises.

C. Notwithstanding any approvals or instructions which must be obtained by the Seawater System Contractor from the Architect in connection with use of premises, the responsibility for the safe working conditions at the site shall remain the Contractor's. The Architect or Owner shall not be deemed to have any responsibility or liability in connection therewith.

1.21 PROTECTION

A. All materials such as valves, fittings, piping, equipment, etc., shall be properly protected and all piping openings shall be temporarily closed by the Seawater System Contractor or his Subcontractor’s installing same, so to prevent obstruction and damage. The Seawater System Contractor shall take precautions to protect his materials from damage and theft.

B. The Seawater System Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or electrical systems provided under his Contract.

1.22 DAMAGE CORRECTION AND EXTRA WORK

A. The Seawater System Contractor shall be held responsible and shall pay for all damages caused by his work to the new and existing building structures and new and existing equipment, piping, duct systems, etc., and all work and finishes installed under this Contract in the new or in existing building. Repair of such damage shall be done as herein before specified, at the expense of the Contractor and to the Architect's satisfaction.

B. The Seawater System Contractor shall promptly correct all work provided under his Contract and rejected by the Architect or The Engineer as defective or as failing to conform to the Contract Documents whether observed before or after completion of work and whether or not fabricated, installed or completed. The Seawater System Contractor shall bear all costs of correcting such rejected work.

C. No claim for extra work will be allowed unless it is authorized by the Architect and The Engineer in writing before commencement of the extra said work.
1.23 TOUCH-UP PAINTING

A. The Seawater System Contractor shall thoroughly clean all equipment and systems provided under this Contract from rust, splatters and other foreign matter or discoloration, leaving every part of each system in an acceptable prime condition. The Seawater System Contractor, for the work under his Contract, shall refinish and restore to the original condition all equipment and piping which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel.

1.24 HOUSEKEEPING PADS

A. The Contractor shall coordinate housekeeping pads for:
   1. All equipment indoors or outdoors
   2. All floor supports or braces

B. The Seawater Pump House Keeping Pads shall be 10" high above the finished floor, the Vacuum Priming Pump’s House Keeping Pad shall be 4" above the finished floor. See drawing SW-05 for specific housekeeping pad details

C. Each pad shall be a minimum of 6" larger than the equipment, support or isolation base in all directions and shall not obstruct floor drains.

D. Pads shall be formed, poured with concrete, and tooled by the CM.

E. Pads shall not be poured until after the Seawater System. coordination drawings are completed and the equipment shop drawings have been submitted and reviewed.

1.25 PIPE SLEEVES, PLATES AND ESCUTCHEONS

A. Where piping pass through masonry or concrete walls or floors (even if openings are cored), the Seawater System Contractor shall provide and set individual sleeves for each pipe and all other work under his charge, as necessary for passage of all pipes. Sleeves shall be of sufficient size to provide 1/2" air space around the pipe passing through (including insulation where pipes are externally insulated). All openings shall be sealed, smoke-proofed and made tight. The Seawater System Contractor shall be responsible for the exact location of sleeves provided under his Contract and shall coordinate all requirements for piping sleeves. In the event that failure to do so requires cutting and patching, it shall be done at this Contractor’s expense.

B. The Seawater System Contractor, for work under his charge, shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabrication or installation.

C. Sleeves passing through lightproof or soundproof walls and floors and through firewalls shall be sealed and made tight using only approved materials and methods.

D. All wall openings or pipe penetrations shall utilize fire stop materials and assemblies bearing a UL Listed rating. Fire stop, UL Listed details for all applicable pipe material penetrations shall be submitted for review prior to fabrication or installation of any materials.
E. Sleeves and inserts shall not be used in any portions of the building, where their use would impair the strength or construction features of the building. Elimination of sleeves must be approved by the Architect and The Engineer.

They shall be of sufficient size to cover sleeved openings for the pipes and of sufficient depth to cover sleeves projecting above floors. Escutcheons shall be as manufactured by Beaton & Caldwell, Dearborn Brass, or Grinnell. All escutcheons shall be of one piece construction.

F. Pipe sleeves shall be made of 16 gauge 316 stainless steel as follows:
1. Sleeves on pipes passing through masonry or concrete construction shall be 16 gauge 316 stainless steel.
2. Sleeves on pipes passing through drywall construction shall be 16 gauge 316 stainless steel.
3. Sleeves on pipes passing through fire rated partitions shall be 16 gauge 316 stainless steel.

G. Sleeves on piping passing through non-rated drywall construction shall be 16 gauge 316 stainless steel

H. Pipe sleeves shall be set as follows:
1. Set sleeves 1" above finish floor, (except set sleeves, 6" above finish floor at penthouses or mechanical rooms and 6" above finished roof) and flush on each side of walls. The Contractor shall coordinate all roof penetrations.
2. Sleeves shall be set securely in place before concrete is poured when placed in concrete construction.

I. Except as otherwise specified, underground piping passing through exterior walls or foundation slabs on grade, shall have penetration closures of the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous belt around the pipe and with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and wall, reducing chances of cathodic reaction between these members.

1. The Seawater System Contractor for work under his charge shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabrication or installation. The inside diameter of the wall opening shall be sized to fit the pipe and ensure a watertight joint. Where applicable, when installing seals, take into account the pipe O.D. if non-standard due to coating or jacketing.
1.26 THROUGH PENETRATION FIRE STOP SYSTEMS

A. See Section 220584.

1.27 MISCELLANEOUS MATERIALS

A. Each trade shall provide all primary and secondary supports and hangers as shown on the drawings and/or as required to support equipment, piping or any other materials provided under the work of this Section.

B. **DO NOT** use any galvanized or steel pipe support channels or cadmium plated threaded rod or fasteners in this project.
   1. Metal poisoning of the marine specimens held in the tanks can occur from leaching of these metals.

C. The work of this Section of designing, furnishing and installing all miscellaneous support work associated with the system, and related items as indicated on the drawings and/or as specified herein, and includes, but is not limited to the items listed herein below.

D. The scope of work shall include:
   1. Intermediate beams to hang piping from the roof. All piping must be hung from beam or supported from the floor. Provide supplemental steel for support of equipment.
   2. Support of piping in shafts in addition to support provided by structure.
   3. Pipe anchors in the building.
   4. Hangers, brackets, angle structures or rods required for the support and protection of seawater plumbing equipment.

E. Submit Shop Drawings of all miscellaneous metal items to Architect and The Engineer for approval, showing sizes and thickness of all members, types of materials, methods of connection and assembly, complete dimensions, clearances, anchorage, relationship to surrounding work by other Trades, shop paint, and other pertinent details of fabrication and installation.

F. Samples
   1. Submit duplicate samples of all materials to be furnished under this Section if, and in size and form, requested by Architect.

G. Do not order materials or begin fabrication until Architect and The Engineer's approval of submittals has been obtained.

H. All materials shall be new stock, free from defects impairing strength, durability or appearance and of best commercial quality for each intended purpose.

I. Metal surfaces shall be clean and free from mill scale, flake, rust and rust pitting. Metal work shall be well formed and finished to required shape and size, true to details, with straight, sharp lines and angles and smooth surfaces. Curved work shall be true radii. Exposed sheared edges shall be eased.
J. Weld all permanent connections. Welds shall be continuous on all exposed surfaces and where required for strength on concealed surfaces. Exposed welds shall be ground flush and smooth, with voids filled with metallic filling compound (metallic filling compound not permitted on surfaces to receive hot-dip galvanizing). Tack-welding will not be permitted unless specifically called for. Do not use screws or bolts where they can be avoided. Where used, heads shall be countersunk, screwed up tight, and threads nicked to prevent loosening.

K. Fastenings shall be concealed where practicable. Thickness of plastic or metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water.

L. Live loads shall be not less than the minimum required by law. Where specific live load are not set forth in the laws and codes applicable to this work, and are not given on the Drawings or in this Specification, designs shall be such as to support the live loads which may normally be imposed without failure, without deflection of more than 1/360 of length of any member, and without permanent deformation, all with a factor of safety of not less than 2½ to 1.

M. Installation
   1. All materials shall be carefully handled and stored under cover in manner to prevent deformation and damage to the materials and to shop finishes, and to prevent rusting and the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.
   2. Work shall be erected square, plumb and true, accurately fitted, and with the tight joints and intersections. All anchors, inserts and other members to be set in concrete or masonry shall be furnished loose by this Trade to be built-into concrete and masonry and by those Trades as the work progresses. Later cutting or drilling shall be avoided wherever possible.
   3. Where members, other than expansion bolts or inserts, are fastened into concrete, set such members in holes formed as specified below, and secure permanently in place by installation of proprietary-type expanding grout manufactured specifically for such purpose, used strictly in accordance with manufacturer's directions. Holes to receive members shall be formed with stainless steel sheet metal sleeves, expanded polystyrene foam, or other approved method to provide at least 1/2 inch clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 inch from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.
   4. Electrolytic Isolation: Where dissimilar metals are to come into contact with one another, isolate each metal by installing EDPM gaskets, non-conductive sealant or a non-metallic non-conductive sleeve.

N. Piping supports shall be coordinated with the building structure and shall span between roof beams as required.

1.28 WATERPROOFING, FLASHING AND COUNTERFLASHING

A. Unless specifically indicated otherwise on the drawings, the Contractor shall provide all counter-flashing and waterproofing of all piping, drains and equipment provided by him, which pierce roofs, walls and other weather barrier surfaces. All work under this paragraph shall be coordinated with the CM.
B. All work shall be performed in a workmanlike manner to ensure weatherproof installation. Any leaks developed due to the Seawater System Contractor's work shall be repaired at his expense, to the Architect's satisfaction.

C. Pipes passing through slabs shall have the sleeve extended above floors as hereinbefore specified to retain any water and the space between the pipe and sleeve caulked waterproof fire stopping. The top and the bottom shall be sealed with monolastic caulking compound.

D. All flashing required for piping penetrations shall be provided by the CM.

1.29 SEAWATER SYSTEM PLUMBING IDENTIFICATION
A. See Section 355553.

1.30 VALVE TAGS, NAMEPLATES AND CHARTS
A. See Section 355553.

1.31 ELECTRICAL WORK, MOTORS AND CONTROLLERS
A. See Sections 350590 and 350840

1.32 PARTS LIST AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE
A. The Seawater System Contractor, in collaboration with The Engineer shall thoroughly instruct the representative(s) of the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. The Seawater System Contractor and The Engineer shall make arrangements, via the CM as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the periods of time in which they are to be given. The Architect shall be completely satisfied that the representative of the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Seawater System Contractor and The Engineer to the Owner's representative, then the Seawater System Contractor and The Engineer shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the specification has been complied with. All time required for Owner's instruction to satisfy the above requirements shall be included in this Contract. No extra compensation for such instructions will be allowed.

B. The Seawater System Contractor and The Engineer shall submit to the Architect for approval a total of six (6) typed sets, bound neatly in loose-leaf binders, of all maintenance and operating instructions for the installation, operation, care and maintenance of all equipment and systems. All data and literature furnished shall be specific for the make and model of the equipment furnished. General non-specific catalog data will not be acceptable. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section such as valves, plumbing fixtures, water
heaters, etc., shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner through The Engineer for approval prior to final submission of manuals.

C. The instructions shall contain information deemed necessary by the Architect and shall include, but not be limited to, the following:

1. Instructional classes on equipment and systems operation for Owner's representative and maintenance personnel, by engineering staff of each Contractor. Minimum of 48 hours of instruction for minimum of (6) people. Instruction shall include:
   a. Explanation of manual and its use.
   b. Summary description of the Plumbing systems.
   c. Purpose of systems.

2. System
   a. Detailed description of all systems.
   b. Illustrations, schematics, block diagrams, catalog cuts and other exhibits.

3. Operations
   a. Complete detailed, step-by-step, sequential description of all phases of operation for all portions of the systems, including start-up, shutdown, adjusting and balancing. Include all posted instruction charts.

4. Maintenance
   a. Parts list and part numbers.
   b. Maintenance, lubrication and replacement charts and manufacturer's recommendations for preventive maintenance, as applicable to his work.
   c. Troubleshooting charts for systems and components.
   d. Instructions for testing each type of part.
   e. Recommended list of on-hand spare parts.
   f. Complete calibration instructions for all parts and entire systems.
   g. Instruction for charging, filling, draining and purging, as applicable.
   h. General or miscellaneous maintenance notes.
   i. Initial Equipment Start-up reports and run time logs.

5. Manufacturer's Literature
   a. Furnish complete listing for all parts required for models actually furnished.
   b. Names, addresses and telephone numbers of manufacturers and suppliers.
   c. Describe and operation of all models actually furnished.
   d. Furnish all and only pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
   e. Internal wiring diagrams and engineering data sheets for all items and/or equipment furnished under each Contract.
   f. Guarantee and warranty data.

6. The Seawater System Contractor shall furnish instructions for lubricating each piece of equipment installed by him. Instructions shall state type of lubricant, where and how frequently lubrication is required. Frame instructions under plexiglass and hang in a location as directed by Architect.
1.33 MANUFACTURER'S REPRESENTATIVE AND START-UP OF SYSTEMS

A. The Seawater System Contractor and The Engineer shall provide, at appropriate time or as directed by the Architect, the on-site services of a competent factory trained Engineer or authorized representative of particular manufacturer of equipment provided under his Contract, such as for the pumps, water heaters, etc. provided under this Contract, to instruct the Owner, inspect, adjust and place in proper operating condition any item provided by him, as applicable.

B. The Seawater System Contractor and The Engineer, as applicable, shall start up and set in operating condition all major equipment and systems, such as the seawater delivery system, etc., in the presence of the applicable equipment manufacturer's representatives, and the Owner and Architect's representatives. In no case will major systems and equipment be commissioned by any of the Seawater System Contractor's forces alone, without the assistance or presence of the equipment manufacturers.

C. A written report shall be issued by the particular equipment manufacturer and the Seawater System Contractor with The Engineer summarizing the results of the start up and performance of each system for the Architect's record. No additional compensation will be allowed for any Contractor for such services.

D. The Seawater System Contractor and The Engineer shall prepare and submit to the Architect for acceptance, a schedule of anticipated system commissioning. No system shall be commissioned without prior acceptance of the schedule by the Architect and Owner. No system shall be commissioned prior to submittal and acceptance of the operations and maintenance manuals.

1.34 CONNECTION TO EQUIPMENT

A. The Seawater System Contractor shall provide all pipe connections, drains, overflows, shock absorbers, relief valves and vents, power connections, etc., to make equipment operable, as provided under other Sections of the specifications, as shown on the Architectural and/or each Trade's drawings and herein specified, including final connections to equipment to result in a complete system, fully operational. All installations shall meet the manufacturer’s recommendations. Coordinate location of all equipment with Architect. Obtain installation diagrams and methods of installation of all equipment from manufacturers. Follow instructions strictly. If additional information is required, obtain same from Architect. If equipment is indicated on the Architectural drawings, it shall also be construed and understood by the Contractor to be constructed as shown on the Plumbing drawings and shall be fully serviced and connected at no extra cost to the Owner.

1.35 ELECTRICAL ROOM REQUIREMENTS

A. The Seawater System Contractors shall not install any piping or equipment in or through electrical rooms, transformer rooms, electrical closets, telephone rooms or elevator machine rooms, unless piping or equipment is intended to serve these rooms. If any Contractor violates this requirement, he shall remove and/or relocate all items as required at his expense and to the satisfaction of the Architect.
1.36 **HOISTING EQUIPMENT AND MACHINERY**

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work under this Contract shall be furnished, installed, operated and maintained in safe condition by the Seawater System Contractor for his material and/or equipment delivered to the designated hoisting area. All costs for hoisting operating services shall be borne by the Seawater System Contractor for all equipment and work under his charge.

1.37 **STAGING**

A. All staging, exterior and interior shall be furnished and erected by the Seawater System Contractor for work under his charge and maintained in safe condition by him for proper execution of his work.

1.38 **CROSS AND INTERCONNECTIONS**

A. No seawater plumbing fixtures, equipment, device or piping shall be installed which will provide a cross or interconnection between a distributing supply or a drainage system, which will permit or make possible the backflow of seawater into the domestic water supply system.

1.39 **CONNECTIONS TO EQUIPMENT**

A. Furnish and install all seawater system components and flexible tubing for all final connections to seawater laboratory and laboratory equipment, casework and sinks provided under other Sections. Roughing for this equipment shall be as indicated on the drawings.

B. The Seawater Contractor shall provide all pipe connections, drains, overflows, shock absorbers, relief valves and vents, power connections, etc., to make equipment operable, as provided under other Sections of the specifications, as shown on the Architectural and/or each Trade's drawings and herein specified, including final connections to equipment to result in a complete system, fully operational. Coordinate location of all equipment with Architect and The Engineer. Obtain installation diagrams and methods of installation of all equipment from manufacturers. Follow instructions strictly. If additional information is required, obtain same from The Engineer. If equipment is indicated on the Seawater System drawings, it shall also be construed and understood by the Seawater System Contractor to be constructed as shown on the Seawater System drawings and shall be fully serviced and connected at no extra cost to the Owner.

C. Obtain exact roughing in dimensions from manufacturers of all service locations before connecting to or roughing for equipment. Provide shutoff valves at each piece of equipment.

D. Owner provided equipment shall be furnished and set under other Sections. Roughing for and final connections to including piping shall be provided by this Seawater System Contractor.
SUSTAINABLE DESIGN INITIATIVES

A. The work will be designed and executed to comply with the U.S. Green Build Council’s Leadership in Energy Efficient Design (LEED) requirements and procedures to obtain a minimum LEED Silver rating. Seawater System Contractor responsibilities relative to the LEED Certification process in general and credit documentation in particular are defined in Division 1.

B. The design and construction work shall satisfy requirements of Massachusetts Executive Order 484.

C. The design and construction scope will consider the intentions of UMass Dartmouth’s Climate Action Plan.

D. Seawater plumbing systems and equipment with particular emphasis on sustainable design and integral to LEED Certification include, but are not limited to, the following:
   1. Premium Efficient Motors
   2. Low Flow Plumbing Fixtures
   3. Low VOC Sealants and Adhesives
   4. Construction IAQ Management Plan

PART 2 – PRODUCTS

E. NOT USED

PART 3 – EXECUTION

F. NOT USED

END OF SECTION
SECTION 350590
SEAWATER PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work shall include labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings but which are usually provided or are essential for proper installation of systems related to this Section, as indicated on the drawings and specified herein.

B. The specifications and drawings describe the minimum requirements that must be met for the installation of work as shown on the drawings and as specified hereunder.

C. Shop drawings.

D. Field acceptance testing.

E. Refer to Section 350500 for file information and requirements.

1.2 REFERENCES

A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.

B. Material standards shall be as specified or detailed hereinafter and as follows:
   1. ANSI American National Standards Institute
   2. ASME American Society of Mechanical Engineers
   3. ASTM American Society of Testing Materials
   4. CS Commercial Standards, U.S. Dept. of Commerce
   5. FM Factory Mutual
   7. UL Underwriters Laboratories, Inc.
   8. OSHA Occupational Safety and Health Act
   9. ASPE American Society of Plumbing Engineers

1.3 SUBMITTALS

A. Refer to Section 350500.

B. Submittals: The following documents shall be provided:
   1. Seawater Intake Pumps – Temporary
   2. Seawater Intake Pumps - Permanent
   3. Seawater Pumps for Degassing Systems
1.4 QUALITY ASSURANCE

A. Manufacturer: The Company that manufactures or provides equipment or products under this section must have documented successful experience with seawater processing.

B. Installer: This Project requires experienced and skilled craftsmen who are thoroughly familiar with working and constructing in the Marine Life Support Systems. The Contractor shall provide documented experience and references to the Owner indicating that they have worked on similar projects with similar equipment and materials. The Owner will have the ultimate authority on deciding whether or not a specific contractor or subcontractor has sufficient related experience in their specific trade to be qualified to perform services on this project. It will be the Final Responsibility of the Successful Bidder for the Seawater System that the Project is Fully Functioning and Operational to the Satisfaction of the Owner before the Project is deemed Complete and Final Payment can be made.

PART 2 - PRODUCTS

2.1 SEA WATER INTAKE PUMPS - TEMPORARY

A. Before the existing Pier is demolished, the Owner shall remove and provide one (1) temporary 4 x 3 Fybroc Seawater Pump to the seawater systems contractor to install as a temporary seawater pump as shown on DWG SW-04. 230 volt 1 phase power will be brought to the pump and the seawater system contractor will assist the Owner in overseeing the start-up and daily performance of this temporary pumping system until the permanent seawater pumps are online.

B. Once the temporary seawater pump is installed and accepted by the owner, installation of the new seawater pump house can commence.

2.2 SEAWATER INTAKE PUMPS

2.3 Approved manufacturers for the Seawater Intake Pumps are Flowserve and Gorman Rupp or an Approved Equal


B. Connect Seawater Pumps to Seawater Piping as shown and described on DWG SW-05

C. PUMP SPARE PARTS (Furnish to the Owner as Attic Stock)
   1. Two (2) spare Flowserve Single Cartridge Seals with ISC2 Pusher w/o Pumping Ring, Silicone Carbide versus Carbon Seat, Viton Elastomers and Alloy 20 Metal Parts.
   2. Two (2) Impeller Gaskets # 4590.2
   3. Two (2) Cover Gaskets #4590.1
4. Four (4) Bearing carrier O-Rings #4610.2
5. Two Adaptor O-Rings

D. Pumps shall be capable of providing 600 gpm of raw ambient seawater at 60 ft TDH.

E. Each Seawater Pump shall be powered by a 15 hp 230/460 volt 3 phase 60 HZ 1200 RPM TEFC Severe Duty Baldor or WEG Motor. Power shall be 230 Volt 3 Phase 60 HZ

F. Alternate Pump Manufacturer:

G. Provide and Install Two (2) 15 hp 230 volt 3 phase Gorman Rupp Self Priming CD4M Seawater Resistant Trash Pumps Model # GRU4B65S-B as shown on the attached drawings SW-05. Pumps shall be capable of providing 600 gpm of raw ambient seawater at 60 ft TDH. The pumps shall be powered by a 15 hp 230 volt 3 phase 1500 RPM TEFC severe inverter duty Baldor or WEG Motor. All internal wetted pump parts shall be Alloy 20. The Pump seal shall have Hastelloy C hardware and Silicone carbide vs Silicone carbide seal faces. These are Pumps P1 and P2 on the Seawater Equipment Schedule, see drawing SW-18 for details.
   a. The pumps shall be mounted on an epoxy coated raised concrete house-keeping pad as dimension and described on drawing SW00.
   b. The pumps shall be mounted on a non-metallic Zanite baseplate which will be anchored to the existing raised concrete house-keeping pad as dimension and described on drawings SW-19 and SW-20. Anchor pump baseplate by thru bolting thru the Non-Metallic Pump Base using 5/8-11 316 Stainless Steel Concrete Wedge Stud Anchors (McMaster-Carr # 97095A301 or Approved equal) to a minimum depth of 2” into the concrete housing keeping pad. Supply four (4) and install two (2) 2 ½” 316 SS 30” Vacuum WIKA Pressure Gauges on suction side of each Seawater Intake Pump. These are Utilities Supply Part # 9768777-829. The Seawater System Controller will be providing the Seawater Systems Piping Contractor with several sensors for installation as part of the Seawater Intake Pump System. These will include seawater flow sensing switches and/or pressure sensors.

H. Connect Seawater Pumps to Seawater Piping as shown and described on DWG SW-05

I. PUMP SPARE PARTS (Furnish to the Owner as Attic Stock)
   1. Two (2) spare Gorman Rupp Cartridge Seals with Hastelloy-C hardware and Silicone Carbide versus Silicone Seat, Viton Elastomers.
   2. Two (2) Impeller Gaskets
   3. Two (2) Cover Gaskets
   4. Four (4) Bearing carrier O-Rings
   5. Two Adaptor O-Rings
      a. Suggest supplier for Flowserve Seawater Intake Pumps is Diversified Pump of Brentwood, NH.
      b. Suggested supplier Gorman Rupp is Hayes Pump, Inc of Concord, MA

J. Supply four (4) and install two (2) Liquid Filled 2 ½” 316 SS 30” Vacuum WIKA Pressure Gauges on suction side of each seawater intake pump. These are WIKA Part # 9110992. Use threaded PVC Bushing to connect Vacuum Gauge to Seawater Pump to prevent electrolysis
K. Supply four (4) and install two (2) Liquid Filled 2 ½” 0-30 psi 316 SS WIKA Pressure Gauges on discharge side of Seawater Pump. These are WIKA Part # 9111018. Use threaded PVC Bushing to connect Vacuum Gauge to Seawater Pump to prevent electrolysis.

L. Summary information on the pump type is included in section 2.10 of this Part.
   1. Suggested suppliers for the Seawater Intake Pumps is Diversified Pump of Brentwood, NH.
   2. Suggested suppliers for WIKA Vacuum Gauges is Utilities Supply (FW Webb) of Methuen, MA or Harrington Plastics of Wilmington, MA.

M. Installation
   1. Install pump and plumb in accordance with manufacturers written instructions and referenced standards.
   2. The pumps shall be installed on an epoxy coated 10” high raised concrete house-keeping pad as detailed and described on drawing SW-05.
   3. The pumps shall be mounted on a non-metallic Polycrcte baseplate
      a. Which will be anchored to the existing raised concrete house-keeping pad
      b. As dimensioned and described on drawings SW-05.
   4. Anchor pump baseplate by thru bolting thru the Non-Metallic Pump Base using 5/8-11 316 Stainless Steel Concrete Wedge Stud Anchors (McMaster-Carr # 97095A301 or Approved equal) to a minimum depth of 2” into the concrete housing keeping pad.
   5. The Seawater System Controller will be providing the Seawater Systems Contractor with several sensors for installation as part of the Seawater Intake Pump System.
      a. These will include seawater flow sensing switches and/or pressure sensors.
      b. Specifications for this installation are included in Section 350830.

N. Start-Up
   1. Start-up of the two (2) Flowserve Seawater Pumps will be performed by a Diversified Pump Representative, start-up for the Gorman Rupp Seawater Intake Pumps will be performed by a Hayes Pump Representative. They will be accompanied by The Engineer personnel, the Seawater System Contractor and the Seawater System Control Company. A copy of the startup report will be provided to the owner.
   2. Install pump and plumb in accordance with manufacturers written instructions and referenced standards.
   3. Pumps shall be anchored to the epoxy coated precast housekeeping pad as described and detailed on the Drawings by using ½” - 13 x 3” L 316 Stainless Steel Concrete Wedge Stud Anchors. (McMaster-Carr # 97095A301 or Approved equal)

2.4 PUMPS FOR DEGASSER SYSTEM

A. Supply three (3) and install two (2) 1 HP Hayward Max Pro VS 500 Pumps Model # SP23510SP with 1 HP 115 volt 1 PH 60 HZ variable speed motors or IWAKI Mag Drive Pump Model # PM41 115 volt 1 PH 60 HZ or Approved Equal. Site electrician shall install Carol Yellow VU-TRON Supreme Cord Caps to each Pump so that they can be plugged into their respective pendant receptacle. These Hayward Max Pro or IWAKI Pumps are shown on drawings SW-08, SW-10, SW-12, SW-15 and SW-18.
   1. These pumps are designated at Pumps P3 and P4 on the drawings and Seawater Equipment Schedule
   2. Electrical shall be 115/1/60.
B. Install Hayward or IWAKI Pumps as shown on DWGs SW-08, SW-10, SW-12 and SW-15 and in accordance with Manufacturer’s instructions.

C. START-UP
1. Start-up of the two (2) Hayward Max Flo or IWAKI Degasser System Seawater Pumps will be performed with The Engineer, the Seawater System Contractor and the Seawater System Control Company.

2.2 SEAWATER PUMP ORDERING SUMMARY TABLE

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<td>2</td>
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PART 3 - EXECUTION

3.1 CONNECTIONS TO EQUIPMENT

A. Refer to Section 350500.

3.2 IDENTIFICATION OF SYSTEMS

A. Refer to Section 350553.

END OF SECTION 350590
SECTION 350840

SEAWATER SYSTEM DEDUCT ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Section 350500 and other Division 1 Specification sections, apply to this section.

1.2 WORK INCLUDED

A. The work shall include labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings but which are usually provided or are essential for proper installation of systems related to this Section, as indicated on the drawings and specified herein.

B. The specifications and drawings describe the minimum requirements that must be met for the installation of all work as shown on the drawings and as specified herein under.

C. Shop drawings.

D. Field acceptance testing.

1.3 REFERENCES

A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.

B. Material standards shall be as specified or detailed hereinafter and as following:
   1. ANSI  American National Standards Institute
   2. ASME  American Society of Mechanical Engineers
   3. CS  Commercial Standards, U.S. Department of Commerce
   4. FM  Factory Mutual
   6. UL  Underwriters Laboratories, Inc.
   7. OSHA  Occupational Safety and Health Act

1.4 NOT USED

1.5 QUALITY ASSURANCE
A. Manufacturer: The Company that manufactures or provides equipment or products under this section must have documented successful experience with processing seawater. All valves shall be of United States manufacturer.

B. Installer: This Project requires experienced and skilled craftsmen who are thoroughly familiar with working and constructing in the Marine Life Support Systems. The Contractor shall provide documented experience and references to the Owner indicating that they have worked on similar projects with similar equipment and materials. The Owner will have the ultimate authority on deciding whether or not a specific contractor or subcontractor has sufficient related experience in their specific trade to be qualified to perform services on this project. It will be the Final Responsibility of the Successful Bidder for the Seawater System that the Project is Fully Functioning and Operational to the Satisfaction of the Owner before the Project is deemed Complete and Final Payment can be made.

A. PART 2 – DEDUCT ALTERNATES

2.1 DEDUCT ALTERNATE #1 SEAWATER FILTRATION SYSTEM

A. Deduct the cost to install two (2) (OFCI) Hayward Bag Filter Systems depicted on DWGs SW-07, SW-08, SW-12, SW-13, and SW-16 and described in specification section 350580 section 2C. This shall include the six (6) Hayward Bag Filters Model # FLV4P2S20T4VS and all of the associated 4” Sch 80 PVC Piping, Valves and fittings. In lieu of the Hayward Bag Filter Systems consisting of three (3) Bag Filters each, provide instead the installation of a single (OFCI) Hayward Bag Filter Model # FLV4P2S20T4VS and 2” Sch 80 PVC Piping and 2” Spears PVC Ball Valves ON EACH Seawater Line A and B for a total of two (2) Hayward Bag Filters to provide some seawater filtration capabilities.

2.2 DEDUCT ALTERNATE #2 SEAWATER HEATING SYSTEM

A. Deduct the cost to install the entire Seawater Heating System depicted on DWGS SW-10, SW-11, SW-12, SW-16, SW-17 and SW-18 and described in specification section 350580 Section 2.1 and 350830. This shall include the two (2) (CFCl) Zodiac Heat Line Heat Exchangers Model # 70 and all of the associated PVC and Copper Piping, valves and fittings, the Belimo Control Valve and the Heating Temperature Control Equipment and installation as described on Drawing SW-17 as well as the entire Seawater Degassing System as depicted on DWGs SW-08, SW-10, SW-12, SW-15, SW-17 and SW-18. which shall include the one (1) (OFCI) CSSI Degasser Model # SWCD-PVC-50-100T, the two (2) Hayward Pro Max Pumps, the two (2) Plast-O-Matic PVC Control valves and all of its associated PVC piping, valves, sensors and controls. In lieu of the Zodiac and CSSI Degassing Seawater Heating System the Owner will furnish one (1) 4 KW Aqualogic In-Line Titanium Electric Heater with Temperature Controller Model #TIL5 Electric shall be 230 Volt 1 Phase. No Contractor installation required.

2.3 DEDUCT ALTERNATE #3 CHILLED SEAWATER SYSTEM

A. Deduct the cost to install one (1) (OFCI) 10 ton Aqualogic Heat Pump Model #HP-7 230 volt 3
phase depicted on DWGS SW-10, SW-11, SW-12, SW-16 and SW-18 and described in specification section 350580 section 2.3. Also delete the single phase to three phase digital inverter. Provide the cost reduction value which shall include the installation of the Aqualogic Heat Pump #HP-7 and all of its associated PVC piping, valves, fittings, housekeeping pad and electrical service and in lieu of the Aqualogic Heat Pump Model HP-7 the Owner will provide one (1) ½ hp Aqua Logic Cyclone Chiller Model #CY-5 with Temperature Controller and submersible Titanium Helix Refrigerant Wand for individual tank cooling capability. Electric shall be 110V 1 phase 60 HZ. No Contractor installation required.

2.4 DEDUCT ALTERNATE #4 800 AMP ELECTRICAL SERVICE

A. This deduct alternate is described in the Electrical Specifications and is not the responsibility of the Seawater Systems Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION / PREPARATION

A. Inspect site conditions in areas where piping and equipment will be installed and verify systems and the impact of the proposed equipment before fabricating systems to be installed.

B. Notify the Architect/TAG Engineering LLC immediately regarding any substantially different conditions than those shown in the Contract Documents.

3.2 IDENTIFICATION OF SYSTEMS

A. Refer to Section 350500.

END OF SECTION 350840
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Company Representative</th>
<th>Company Address</th>
<th>Company Phone Number</th>
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<tr>
<td>Maine Coast Construction</td>
<td>John Davee</td>
<td>107 Elm St, Camden, ME</td>
<td>207-236-6000</td>
</tr>
<tr>
<td>Reid Tech</td>
<td>Atlantic Mech Inc.</td>
<td>25 Ind. Park, Woolwich, ME</td>
<td>207-356-0856</td>
</tr>
<tr>
<td>THE PENOBSCOT CO</td>
<td>Dave Nazareff</td>
<td>519 West St, Rockport</td>
<td>207-236-6390</td>
</tr>
<tr>
<td>PC Construction</td>
<td>Joe Picicano</td>
<td>131 Presumpscot St, Portland, ME</td>
<td>207-874-2523</td>
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<tr>
<td>Pullen Bros. Inc.</td>
<td>Mark Pullen</td>
<td>10 Howe St, Augusta, ME</td>
<td>207-623-8371</td>
</tr>
<tr>
<td>Lepa Const</td>
<td>David Keen</td>
<td>341 ME</td>
<td>207-269-2765</td>
</tr>
<tr>
<td>Brian Bowman</td>
<td>Bowman Construction</td>
<td>352 Meadowbrook Trace, Newport, ME</td>
<td>368-2405</td>
</tr>
<tr>
<td>FGS CMT</td>
<td>Chris Penney</td>
<td>24 Capital Ave, Lisbon, ME</td>
<td>207-593-4068</td>
</tr>
<tr>
<td>T. Buck Const.</td>
<td>Mark McPeters</td>
<td>302 B Auburn Rd, Turner, MA</td>
<td>207-783-6223</td>
</tr>
<tr>
<td>The Fish Guy</td>
<td>Josh Wolfson</td>
<td>50 Main St, Ashland, MA</td>
<td>508-314-1942</td>
</tr>
</tbody>
</table>
University of Maine
Orono, Maine

Darling Marine Center
Walpole, Maine

Flowing Seawater Laboratory
Renovation & Infrastructure Upgrades
Project Number 31804

Ellenzweig
Architects | Planners
230 Congress Street
Boston, MA 02110
T 617 491-5575
F 617 868-2318

Tag Engineering, Inc.
BR+A Consulting Engineers
Becker Structural Engineers
Sebago Technics, Inc.
Ellana, Inc.

Notes:
1. TOPOGRAPHIC INFORMATION PROVIDED TO ELLENZWEIG BY UMAINE VIA SHYKA, SHEPPARD & GARSTER DRAWING 16-130 DATED JANUARY 4, 2017

SITE PLAN

N

A0.1

Construction Documents
Scale: 1/16" = 1'-0"
University of Maine
Orono, Maine
Darling Marine Center
Walpole, Maine
Ellenzweig Architects | Planners
230 Congress Street
Boston, MA 02110
T  617 491-5575
F  617 868-2318

Ellana, Inc.120 Presidential Way Suite 320
Woburn, MA 01801
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Ellena, Inc. 10 Guest Street, 4th Floor
Boston MA 02135
T  617-254-0016

Ellena, Inc. 75 York Street, #3
Portland Maine 04101
T  207-879-1838

Ellena, Inc. 75 John Roberts Road, Suite 4A
South Portland ME 04106
T  207-200-2100

Notes:

Job Number

Drawing By

Checked By

Filename

Date

Revisions

Construction Documents

Scale:

Keyplan

N

SEAWATER LAB
FLOOR PLAN

SEAWATER LAB
Floor Plan
Drawing Sheet

Addendum 1