ADDENDUM NO. 2
TO THE
CONTRACT DOCUMENTS
FOR
95 MECHANIC STREET SEAWALL & WHARF REPLACEMENT
PORTSMOUTH, NH

To all Plan Holders:

The following changes, additions, and/or deletions are hereby made a part of the Contract Documents for the 95 Mechanic Street Seawall & Wharf Replacement Project dated March 2021, as fully and completely as if the same were fully set forth therein:

A. BID DUE DATE

1. The Bid Due Date has been extended and is now 11:00 AM on May 6, 2021.

B. DEADLINE FOR BIDDER QUESTIONS

1. The Deadline for Bidder Questions has not been extended and was Close of Business on April 26, 2021.

C. PLANHOLDERS LIST

1. The Plan Holders List as provided by the City is appended hereto as Attachment No. 1.

D. PRE-BID MEETING NOTES

1. The Pre-Bid Meeting Notes as provided by CivilWorks New England are appended hereto as Attachment No. 2.

E. ADDITIONAL SPOT MUDLINE ELEVATIONS

1. Additional spot mudline elevation data along the limits of the proposed work is provided on Sheet C-002 of the attached Addendum Plans.

F. CONTRACT DOCUMENTS

1. Replace the Proposal Form with the revised Proposal Form appended hereto, as Attachment No. 3.

G. PHOTOS

1. Included as Attachment No. 4 are representative photos of the granite blocks/stones that may be utilized provided they meet the specifications for seawall construction that are located at the Portsmouth DPW Yard.

H. TECHNICAL SPECIFICATIONS

Revised Technical Specifications are included as Attachment No. 5.

1. Replace Section 01025, MEASUREMENT AND PAYMENT with the revised Section 01025, MEASUREMENT AND PAYMENT appended hereto.

2. Replace Section 02050, DEMOLITION AND REMOVAL with the revised Section 02050, DEMOLITION AND REMOVAL appended hereto.

3. Replace Section 02301, STEEL H-PILES with the revised Section 02301, STEEL H-PILES appended hereto.

4. Replace Section 02368, TIMBER PILES with the revised Section 02368, TIMBER PILES appended hereto.

5. Replace Section 02457, DYNAMIC PILE TESTING with the revised Section 02457, DYNAMIC PILE TESTING appended hereto.

6. Replace Section 03310, CONCRETE with the revised Section 03310, CONCRETE appended hereto.

7. Replace Section 03200, REINFORCING STEEL with the revised Section 03200, REINFORCING STEEL appended hereto

8. Replace Section 04400, STONE MASONRY with the revised Section 04400, STONE MASONRY appended hereto.

I. DRAWINGS

1. Replace Sheets 1 of 18 with revised Sheets 1 of 18 appended hereto, as Attachment No. 6.

J. QUESTIONS RECEIVED DURING BIDDING

Questions provided by the bidders are in **BOLD** and responses are provided *italic.*

1. **What are the load limits on the existing Wall?**

   Bidders shall refer to Sheet C-002 for load restrictions.

2. **Are there any Channel restrictions for barge/boat access.**

Because of the various size and drafts of vessels, bidders should familiarize themselves with the area to understand potential restrictions and limitations of the working area.

3. **Do Permits allow barges to rest on the seabed?**

   Temporary resting of a barge in the intertidal zoning is not within the jurisdiction of the agencies that have issued permits for the project. The Contractor should implement best practices to reduce the potential impacts to water quality and habitat.

4. **Can the adjacent City-owned parcel be used for a laydown area.**

   The parcel directly north of the project site can potentially be used for a laydown area pending approval by the City. The Contractor would be responsible for securing the site during construction and restoring the site to existing conditions at the end of the project.

5. **Since Power must be maintained, will National Grid provide the temporary power if power lines need to be relocated?**

   The contractor is responsible for contacting and coordinating with Eversource. To date we have spoken with:

   Contact Eversource:
   Nick Kosko
   Field Supervisor Electrical Design
   Eversource Eastern Region
   Phone: 603-332-7534
   Cell: 603-345-0387
   Email: nickolai.kosko@eversource.com

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ATTACHMENT 1

Name (Original Name)	User Email	Total Duration (Minutes)	Guest
Amy Chastain (Peter Rice)	phrice@cityofportsmouth.com	CITY	HOST
Peter Rice	phrice@cityofportsmouth.com	CITY	HOST
Raymond Pezzullo	rcpezzullo@cityofportsmouth.com	CITY	HOST
Dennis Moran	dgmoran@tighebond.com	CONSULTANT	HOST
Duncan Mellor	dmellor@civilworksne.com	CONSULTANT	HOST
Scott Brady	sbrady@sumcoeco.com	SumCo Eco-Contracting	Yes
L Whitr	lwhite@cwhitemarine.com	C. White Marine, Inc.	Yes
Dan Galante	dan@tford.com	T Ford Company, Inc.	Yes
Shane Moores	shane@riversideandpickering.com	Riverside & Pickering Marine	Yes
Kuerstin Fordham	kuerstin@riversideandpickering.com	Riverside & Pickering Marine Contractors	Yes
Brett Patten	brett@hlpatten.com	H.L. Patten Construction, Inc	Yes
Kevin Buruchian	kevin@ack-marinecontracting.com	ACK Marine	Yes
Barry Belcastro	barry@ack-marinecontracting.com	ACK Marine & General Contracting, LLC	Yes
Lucinda Tilas	lucinda@ca-inc.net	Chesterfield Associates Inc	Yes
Bruce Anderson	bruce@hlpatten.com	HL Patten Construction, Inc	Yes
Shawn Toohey	shawn@prockmarinecompany.com	Prock Marine Company	Yes
Gaelen Magee	gmagee@masbuildingandbridge.com	MAS Building & Bridge, Inc.	Yes

Meeting ID	Topic	Start Time	End Time
96978406485	Pre-Bid Meeting for 95 Mechanic Street Seawall & Wharf Replacement	4/20/2021 9:46	4/20/2021 10:21

User Email	Duration (Minutes)
phrice@cityofPortsmouth.com	36

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ATTACHMENT 2

CIVILWORKS NEW ENGLAND
181 WATSON ROAD
P.O. BOX 1166
DOVER, NH 03821-1166
PHONE: 603.749.0443 FAX : 603.749.7348

MEETING MINUTES

Meeting Date: April 20, 2021, 10:00am (web based meeting)

Owner: City of Portsmouth, Department of Public Works

Ref: Bid No. 31-21
95 Mechanic St Seawall & Wharf Replacement

Re: Pre Bid Meeting Agenda

From:
Raymond C. Pezzullo, PE
Assistant City Engineer
City of Portsmouth
Public Works Department

Duncan Mellor, PE
Civilworks New England (CNE)
Owners Project Representative

A web based pre bid meeting was held as scheduled which followed the meeting agenda.

Upon discussion of a staging area, Peter Rice, Director of Public Works, noted that contractor use the proposed grass staging area to the north of the project site is owned by the City, but controlled by Prescott Park and its use still needs to be confirmed. This will be issued in an addendum. Duncan Mellor, CNE, noted that the grass site will need to be restored after use and erosion controls will be needed if soil is disturbed.

Questions:
Dan Galante of T Ford Question:

Q: Asked about installation of protection on the power lines?
A: Contractor to coordinate with Eversource.

Q: Can we provide Eversource point of contact information?
A: Yes, contact information will be provided by addendum.

Several contractors introduced themselves, who missed initial introductions.

Site access at low tide today was offered, with note that the site can also be seen from Pierce Island.

With no further questions the meeting was ended.

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ATTACHMENT 3

95 Mechanic Street Seawall and Wharf Replacement

Bid #31-21

PROPOSAL FORM

CITY OF PORTSMOUTH, N.H.

To the City of Portsmouth, New Hampshire, herein called the Owner.

The undersigned, as Bidder, herein referred to as singular and masculine declares as follows:

1. All interested in the Bid as Principals are named herein.

2. This bid is not made jointly, or in conjunction, cooperation or collusion with any other person, firm, corporation, or other legal entity;

3. No officer, agent or employee of the Owner is directly or indirectly interested in this Bid.

4. The bidder has carefully examined the site of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this Bid, and the bidder has carefully read and examined the Drawings, Agreement, Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;

5. The bidder understands that the quantities of work calculated in the Bid or indicated on the Drawings or in the Specifications or other Contract Documents are approximate and are subject to increase or decrease or deletion as deemed necessary by the Portsmouth City Engineer. Any such changes will not result in or be justification for any penalty or increase in contract prices; and agrees that, if the Bid is accepted the bidder will contract with the Owner, as provided in the Contract Documents, this Bid Form being part of said Contract Documents, and that the bidder will supply or perform all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other activities required by the Contract Documents in the manner and within the time therein set forth, and that the bidder will take in full payment therefor the following item prices, to wit:

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
1.	General Requirements	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

2.	Mobilization (Shall Not exceed 10% of the Total Amount of all Bid Items)	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
3.	Quality Control				
3A.	Grain Size Through No. 200 Sieve	EA	4	$_____	$_____

UNIT PRICE IN WORDS: _____

3B.	Moisture Density Relationship-Granular Materials	EA	2	$_____	$_____

UNIT PRICE IN WORDS: _____

3C. 2	Dry Density and As-Placed Moisture Content	½ DAY	4	$_____	$_____

UNIT PRICE IN WORDS: _____

3D.	Concrete Compressive Strength	EA	20	$_____	$_____

UNIT PRICE IN WORDS: _____

3E.	Pavement Density	½ DAY	1	$_____	$_____

UNIT PRICE IN WORDS: _____

3F.	Pile Splice Weld Testing	½ DAY	12	$_____	$_____

UNIT PRICE IN WORDS: _____

4.	Erosion and Sedimentation Controls	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
5.	Demolition and Removal				
5A.	Seawalls	LS	1	$_____	$_____
UNIT PRICE IN WORDS: _____					
5B.	Cutoff Timber Piles	EA	10	$_____	$_____
UNIT PRICE IN WORDS: _____					
5C.	Extract Timber Piles	EA	10	$_____	$_____
UNIT PRICE IN WORDS: _____					
6.	Temporary Earth Retaining Systems and Cofferdams				
6A.	Earth Retaining Systems	LS	1	$_____	$_____
UNIT PRICE IN WORDS: _____					
6B.	Cofferdams	LS	1	$_____	$_____
UNIT PRICE IN WORDS: _____					
7.	Dewatering	LS	1	$_____	$_____
UNIT PRICE IN WORDS: _____					
8.	H-Piles				
8A.	Furnish H-Piles	LF	880	$_____	$_____
UNIT PRICE IN WORDS: _____					

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
8B.	Install H-Piles	LF	600	$_____	$_____

UNIT PRICE IN WORDS: _____

8C.	Field Splices	EA	4	$_____	$_____

UNIT PRICE IN WORDS: _____

8D.	Initial Drive PDA	DAY	1	$_____	$_____

UNIT PRICE IN WORDS: _____

8E.	Re-Strike PDA	DAY	1	$_____	$_____

UNIT PRICE IN WORDS: _____

9.	Seawalls				
9A.	Concrete Seawall	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

9B.	Steel Sheet Pile Seawall STA 0+70 to 1+065	LF	36.5	$_____	$_____

UNIT PRICE IN WORDS: _____

9C.	Steel Sheet Pile Seawall STA 1+065 to 1+30	LF	23.5	$_____	$_____

UNIT PRICE IN WORDS: _____

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
10.	Site Restoration	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

11.	Demobilization and Clean-Up	LS	1	$_____	$_____

UNIT PRICE IN WORDS: _____

TOTAL BASE BID AMOUNT FOR DETERMINATION OF LOWEST BID

TOTAL SUM OF EXTENDED UNIT PRICE
ITEMS PLUS LUMP SUM ITEMS (ITEMS 1 – 11)

$_____
(Amount in Figures)

_____ Dollars and _____ Cents
(Amount in Words)

PROPOSAL FORM "Base Bid"
The award will be based on the Base bid, or the Base Bid with any combination of Add Alternates the City deems to be in its best interest.

ADD ALTERNATIVES

At the owner's option, and in accordance with the General Conditions, the following Alternates Lump Sum and Unit Prices shall be used for additions and/or deletions to the Scope of Work, and shall be inclusive of furnishing and installing of material, labor, trucking, overhead, profit, equipment, hoisting, engineering, scaffolding, power hookups, protection, shop drawings, taxes, permits, appliances, delivery and supervision and shall remain in effect until completion of the contract.

The Owner will inform the Contractor which Alternates, if any, will be added to the Base Bid prior to contract execution and bonding.

ADD ALTERNATIVES:

ADD ALT.	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
Add Alt 1.	Wharf, Additional General Req's	LS	1	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 2.	Wharf, Furnish PT Timber Piles	LF	3,640	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 3.	Wharf, Install PT Timber Piles	LF	3,250	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 4.	Wharf, Furnish H-Piles	LF	600	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 5.	Wharf, Install H-Piles	LF	550	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 6.	Wharf PT Timber Superstructure and Decking	SF	3,854	$_____	$_____
UNIT PRICE IN WORDS: _____					
Add Alt 7.	Wharf, Ornamental Railing	LF	130	$_____	$_____
UNIT PRICE IN WORDS: _____					

ADD ALT.	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	TOTAL COST
Add Alt 8.	Seawall, Chain Link Fence	LF	130	$_____	$_____

UNIT PRICE IN WORDS: _____

Add Alt 9.	Wharf, IPE Timber Decking	SF	3,854	$_____	$_____

UNIT PRICE IN WORDS: _____

Deduct Alt 1.	Wharf, PT Timber Decking	SF	3,854	$_____	$_____

UNIT PRICE IN WORDS: _____

The undersigned agrees that for extra work, if any, performed in accordance with the terms and provisions of the Contract Documents, the bidder will accept compensation as stipulated therein.

_____ _____

Date Company

By:_____
Print Name

By:_____
Signature

Title:_____

_____
Business Address

_____
City, State, Zip Code

Telephone:_____

The Bidder has received and acknowledged Addenda No. _____ through _____.

All Bids are to be submitted on this form and in a sealed envelope, plainly marked on the outside with the Bidder's name and address and the Project name as it appears at the top of the Proposal Form.

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ATTACHMENT 4

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ATTACHMENT 5

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 ADMINISTRATIVE SUBMITTALS

A. Application for Payment: Suitable to Owner and as specified herein.

B. Final Application for Payment: As specified herein.

1.2 APPLICATION FOR PAYMENT

A. Use separate, detailed Application for Payment Form suitable to Owner for each payment application.

B. Preparation:

1. List each Change Order and Written Amendment executed prior to date of submission as a separate line item.

2. Submit three (3) copies of Application for Payment Form, and such supporting data as may be requested by Owner. Deduct 10 percent retainage unless otherwise agreed to between Owner and Contractor.

1.3 MEASUREMENT – GENERAL

A. Units of measure shown on the Bid Form shall be as follows unless specified otherwise.

Item	Method of Measurement
DAY	Field Measurement by Owner/Engineer
EA	Each, Field Measurement by Owner/Engineer
LF	Linear Foot, Field Measurement by Owner/Engineer (measured from the cutoff elevation to the tip for piles).
LS	Unit is one, no measurement will be made
SF	Square Foot, Field Measurement by Owner/Engineer

1.4 PAYMENT

A. General: Progress payment requests shall be submitted monthly.

B. Payment for Lump Sum Work covers all Work necessary to furnish, install and/or complete the following items.

Bid Item No.	Description
1.	General Requirements: Project management; submittals; full-time field supervision; construction meetings; pre- and post-construction condition surveys; vibration monitoring; coordination for telephone; electric, water, sanitary sewer, and gas company requirements; bonds and insurance requirements; downtime due to weather conditions; debris control; traffic control; site security (e.g., temporary fencing); construction phasing; survey

Bid Item No.	Description
	as required; permit requirements; temporary parking area, and closeout documents. As part of this Bid Item, the Contractor shall be responsible for preparing hand annotated As-Built Drawings that reflect the revisions/changes made in the field. These drawings shall be utilized by the Owner/Engineer at the end of the project to prepare the Project Record Drawings. Progress payments to the Contractor by the Owner shall be contingent upon the daily preparation and maintenance of these drawings as determined by regular inspections by the Owner/Engineer. Payment for this Bid Item shall be 35% of the Lump Sum Bid price in the first month with the remainder of the payment (65%) being equally divided among the remaining months in the contract time. Payment for this Bid Item shall be considered full compensation for all labor, materials, off-site disposal, and other fees, equipment, supervision, and supplies required for the work.
2.	Mobilization: Move in personnel, equipment, and materials; and set up and install temporary trailer(s) and utilities as required.
4.	Erosion and Sedimentation Controls: Furnish, install, and maintain erosion and sedimentation controls as required, and remove erosion and sedimentation controls in their entirety at completion.
5A. 2	Demolition and Removal, Seawalls: Furnish all labor, equipment, and materials to remove the existing granite block seawalls; load, transport, and dispose of excess soil; load, transport, and dispose of excess granite blocks; and load, transport, and dispose of all demolition debris, including but not limited to concrete, timber, and steel. The Contractor may, at its discretion and for its convenience, stockpile soil and granite blocks removed from the site at the DPW's designated stockpile area, but shall remove and dispose of the stockpiled materials at the conclusion of the project at no additional cost to the Owner. All materials removed from the site shall be disposed of offsite in accordance with all local, State, and Federal Laws and Regulations.
6A.	Temporary Earth Retaining Systems: Furnish all labor, equipment, and materials to install the Contractor designed landside Temporary Earth Retaining Systems in order to allow the new seawalls to be constructed as specified and shown in the Contract Documents.
6B.	Temporary Cofferdams: Furnish all labor, equipment, and materials to install the Contractor designed waterside Temporary Cofferdams in order to allow the new seawalls to be constructed as specified and shown in the Contract Documents.
7.	Dewatering: Furnish all labor, equipment, and materials to install, operate, maintain, and remove temporary sumps, dewatering wells, pumps, discharge hoses, dewatering bags, erosion and sedimentation controls, and miscellaneous piping as required to dewater the Temporary Earth Retaining

Bid Item No.	Description
	Systems and Temporary Cofferdams as specified and shown in the Contract Documents.
9A.	Concrete Seawall: Furnish all labor, equipment, and materials to install the cast-in-place concrete pile caps, granite block facing (including loading and transporting granite blocks/stones from the DPW's designated stockpile area, as required), cast in place concrete stem walls, weep holes, geotextile fabric, Crushed Stone Bedding and Backfill, and cap stones as specified and shown in the Contract Documents.
10.	Site Restoration: Furnish all labor, equipment, and materials to install new Bituminous Asphalt Pavement, chain link fencing between the seawall and Peirce Island Bridge, and loam and seed disturbed areas as specified and shown in the Contract Documents.
11.	Demobilization and Cleanup: Move out personnel, equipment, temporary fencing, and unused material and remove all rubbish and debris.

C. Payment for unit price items covers all Work necessary to furnish, install, and/or complete the following items.

Bid Item No.	Description
3A.	Grain Size Through No. 200 Sieve: Perform grain size analyses in accordance with ASTM D422.
3B.	Moisture Density Relationship-Granular Materials: Perform moisture density tests in accordance with ASTM D1557.
3C.	Dry Density and As-Placed Moisture Content: Perform in-place dry density and as-placed moisture content in accordance with ASTM D2922 and D3017.
3D.	Concrete Compressive Strength: Provide a Laboratory Technician to collect, cure, and test concrete cylinders in accordance with ASTM C31 and C39.
3E.	Pavement Density: Provide a Laboratory Technician to collect, cure, and test asphalt cylinders/cores in accordance with ASTM D2726.
3F.	Pile Splice Weld Testing: Provide a field technician to complete non-destructive testing of all pile splice welds as specified and shown in the Contract Documents.
5B.	Demolition and Removal, Cutoff Timber Piles: Furnish all labor, equipment, and materials to cut off the tops of existing timber piles a minimum of 1 foot below the bottom of the proposed pile cap for the concrete seawall. All piles shall be disposed of offsite in accordance with all local, State, and Federal Laws and Regulations.
5C.	Demolition and Removal, Extract Timber Piles: Furnish all labor, equipment, and materials to extract timber piles that conflict with the construction of the proposed seawalls and other structures using a vibratory hammer. All piles

Bid Item No.	Description
	shall be disposed of offsite in accordance with all local, State, and Federal Laws and Regulations.
8A.	Furnish H-Piles: Furnish the seawall support piles at the lengths indicated and as specified and shown in the Contract Documents.
8B. 2	Install H-Piles: Furnish all labor, equipment, and materials to construct a pile driving template; install the seawall support piles; cut the piles off at the specified elevation; and furnish and install the bearing plates at the tops of the piles as specified and shown in the Contract Documents. Pile segments and/or additional piles remaining following pile driving shall become the property of the Owner, and shall be transported by the Contractor to the DPW's designated stockpile area at no additional cost to the Owner.
8C.	Field Splices: If the specified support pile order lengths are insufficient, furnish all labor, equipment, and materials to install Field Splices as specified and shown in the Contract Documents.
8D.	Initial Drive PDA: Provide a PDA Consultant and all labor, materials, and equipment that are necessary to conduct high strain testing of the indicator piles during the initial drive in accordance with Section 02547, DYNAMIC PILE TESTING. This Bid Item shall also include two (2) CAPWAPs and a Summary Report.
8E.	Restrike PDA: Provide a PDA Consultant and all labor, materials, and equipment that are necessary to conduct high strain testing of the indicator piles during the re-strike drive in accordance with Section 02547, DYNAMIC PILE TESTING. This Bid Item shall also include two (2) CAPWAPs and a Summary Report.
9B.	Steel Sheet Pile Seawall, STA 0+70 to 1+065: Furnish all labor, equipment, and materials to install the steel sheet piles, granite fascia, in-fill concrete, shear studs, cast in place concrete cap, geotextile fabric, Crushed Stone Bedding and Backfill, and cap stones as specified and shown in the Contract Documents.
9C.	Steel Sheet Pile Seawall, STA 1+065 to 1+30: Furnish all labor, equipment, and materials to install the steel sheet piles in segments if required, due to overhead utility line clearance constraints; install the sheet pile splices; and install the granite fascia, in-fill concrete, shear studs, cast in place concrete cap, geotextile fabric, Crushed Stone Bedding and Backfill, and cap stones as specified and shown in the Contract Documents. The Contractor shall make its own determination regarding the number of pile segments and splices required and there shall be no additional compensation for cutting or splicing the piles above and beyond the established per LF bid price.

D. Payment for alternate lump sum and/or unit price items covers all Work necessary to furnish, install, and/or complete the following items.

Add Alt. Bid Item No.	Description
Add Alt No. 1.	Wharf, Additional General Requirements: Provide additional General Requirements as specified under Base Bid Item No. 1 and as required for the construction of the Wharf. Payment for this Bid Item shall be 35% of the Lump Sum Bid price in the first month with the remainder of the payment (65%) being equally divided among the remaining months in the contract time for the Wharf. Payment for this Bid Item shall be considered full compensation for all labor, materials, off-site disposal, and other fees, equipment, supervision, and supplies required for the work.
Add Alt No. 2	Wharf, Furnish PT Timber Piles: Furnish the piles at the lengths indicated and as specified and shown in the Contract Documents.
Add Alt No. 3.	Wharf, Install PT Timber Piles: Furnish all labor, equipment, and materials to construct a pile driving template; install the piles; and cut the piles off at the specified elevation as specified and shown in the Contract Documents.
Add Alt No. 4.	Wharf, Furnish H-Piles: Furnish the piles in segments, if required, due to overhead utility line clearance constraints as specified and shown in the Contract Documents. The Contractor shall make its own determination regarding the number of pile segments and splices required and there shall be no additional compensation for cutting or splicing the piles above and beyond the established per LF bid price.
Add Alt No. 5.	Wharf, Install H-Piles: Furnish all labor, equipment, and materials to construct a pile driving template; install the piles; install the splices; cut the piles off at the specified elevation; and furnish and install the top plate connectors as specified and shown in the Contract Documents. The Contractor shall make its own determination regarding the number of pile segments and splices required and there shall be no additional compensation for cutting or splicing the piles above and beyond the established per LF bid price.
Add Alt No. 6.	Wharf, PT Timber Superstructure and Decking: Furnish all labor, equipment, and materials to install the PT Timber Superstructure and Decking as specified and shown in the Contract Documents.
Add Alt No. 7.	Wharf, Ornamental Railing: Furnish all labor, equipment, and materials to install the ornamental railing on the Timber Wharf as specified and shown in the Contract Documents.
Add Alt No. 8.	Seawall, Chain Link Fencing: Furnish all labor, equipment, and materials to install Chain Link Fencing behind along the Seawall as specified and shown in the Contract Documents.
Add Alt No. 9.	Wharf, IPE Timber Decking: Furnish all labor, equipment, and materials to install IPE Timber Decking as specified and shown in the Contract Documents.

Add Alt. Bid Item No.	Description
Deduct Alt No. 1.	Wharf, PT Timber Decking: Delete all labor, equipment, and materials for the installation of the PT Timber Decking as specified and shown in the Contract Documents.

E. Payment for equipment, materials, and labor for items not included on the Bid or described in Article PAYMENT, herein, shall be considered incidental and no separate payment will be made.

1.5 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.

2. Quantities of material wasted or disposed of in a manner not called for under the Contract Documents.

3. Rejected loads of material, including material rejected after Contractor has placed it.

4. Material not unloaded from transporting vehicle.

5. Defective Work not accepted by the Owner/Engineer.

6. Material remaining on hand after completion of Work.

1.6 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Final Payment: Shall be made only for materials incorporated into the Work in the Contract; no partial payments shall be made for equipment or materials delivered to the site but not used, unless otherwise provided for by the Bid Form and/or as agreed to by the Owner.

1.7 FINAL APPLICATION FOR PAYMENT

A. Reference the Owner's Contract, and as may otherwise be required in the Plans and Technical Specifications.

B. Prior to submitting final application, make acceptable delivery of required documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02050

DEMOLITION AND REMOVAL

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the work associated with demolition and removal as specified and shown on the Drawings.

1.2 GENERAL

A. The Contractor shall submit to the Engineer a schedule for removal and stockpiling.

PART 2 PRODUCTS

2.1 GENERAL

A. Employ experienced workers or professional cleaners for final cleaning.

PART 3 EXECUTION

3.1 GENERAL

A. Remove existing concrete, timber, steel, and other deteriorated materials as required to complete the work under this Contract.

B. Dispose of all demolition related material (not limited to soils, unused stones, etc) offsite, in accordance with all local, State, and Federal Laws and Regulations.

C. The Contractor may, at its discretion and for its convenience, stockpile excess soil and granite stone removed from the site at the DPW's designated stockpile area, but shall remove and dispose of the stockpiled materials at the conclusion of the project at no additional cost to the Owner. This includes all required testing as needed.

END OF SECTION

SECTION 02301

STEEL H-PILES

PART 1 GENERAL

1.1 WORK INCLUDED

A. This Section includes installing the steel H-piles, complete.

1.2 REFERENCES

A. Following is a list of standards that may be referenced in this section:

1. American Society of Testing and Materials (ASTM).

2. American Welding Company (AWS).

1.3 DEFINITIONS

A. Design Position: The location of the centroid of a pile at cutoff (x, y, and z coordinates) as shown on the Drawings.

B. Elevations: Referenced to the datum shown on Drawings.

C. Fixed Leads: Leads that are pinned to a crane boom at the top and equipped with a hydraulic spotter at the bottom that is capable of spotting the pile to its correct position and maintaining pile alignment during driving.

D. Impact Stress: Stress transferred to the pile head at impact from the driving train, as determined from a Wave Equation Analysis.

E. Obstruction: Sudden and significant increase of penetration resistance and deviation of pile out of tolerance resulting from encountering a subsurface or physical condition.

F. Practical Refusal: Penetration resistance of at least 120 blows per foot for 3 consecutive feet, 200 blows per foot for 1 foot, or 50 blows per inch for 2 consecutive inches, whichever occurs first, and to continue pile driving would be impractical. These criteria apply only to the hammer sizes and operation as specified.

G. Rated Hammer Energy

1. Open End Diesel Hammers and Single Acting Air or Hydraulic Hammers: Product of rated stroke multiplied by ram weight.

2. Closed End Diesel Hammers and Double Acting Air or Hydraulic Hammers: Rated Energy from manufacturer's literature.

H. Set: Pile Penetration in inches per blow.

I. Sweep: Deviation from straightness measured along two perpendicular faces of pile while not subject to bending forces.

J. Swinging Leads: Pile driving leads that are not pinned at the top and do not have a hydraulic spotter to position the leads.

K. Termination Penetration Resistance: Penetration resistance (blows per foot) at which driving may be terminated, as established by the Engineer.

L. Transferred Hammer Energy: Energy transferred to the pile head from driving train impact, as determined from a Wave Equation Analysis.

1.4 SUBMITTALS

A. Administrative and Quality Control Submittals:

1. Certification that the steel piling conforms to the material specifications.

2. Manufacturer's Certification of Compliance: Manufactured products.

3. Proposed method(s) to align and maintain pile alignment, including types of leads to be used with details and methods and equipment to be used to measure alignment.

4. Manufacturer's Specifications of Products, and Maintenance Manuals, for hammers, drills, and auxiliary equipment.

5. Field splice shop drawings.

6. Welder Qualifications and Certifications: Factory and field welding.

7. Welding Procedures: Factory and field welding. When steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service shall be utilized. See Appendix X 3 of Specification A6/A6M.

8. Pile layout shop drawing that indicates the exact number of piles, detail dimensions, fabrication, and erection details, setting and driving procedures, and detail sequence of operation and installation.

9. Complete Pile Hammer Data Sheet (Exhibit B).

All submittals shall be received and approved by the Engineer prior to ordering materials and starting work.

B. Contract Closeout Submittals

1. Pile Driving Log and Record: At end of each working day, submit two copies of each record to the Engineer for every pile constructed that day.

1.5 QUALIFICATIONS

A. Piling Installer: Minimum of 10 years of past successful experience with similar piling installation on at least 5 projects completed within the same time period.

1.6 STORAGE AND HANDLING

A. Protection

1. Store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.

2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use.

3. Do not allow installation of damaged or otherwise non-complying material.

4. Use all means necessary to protect the installed work and materials of all other trades

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary as approved by the Engineer and at no additional cost to the Owner.

1.7 VIBRATION MONITORING

A. The Contractor shall submit a vibration monitoring plan a minimum of fourteen (14) days prior to pile driving activities. At a minimum, the vibration monitoring plan shall include the following:

1. A written description of vibration monitoring activities including the proposed locations of seismographs and the anticipated dates and times of monitoring activities.

2. A listing of structures, utilities, and other vibration sensitive receptors that may be impacted by vibrations.

3. Mitigation measures that shall be implemented to limit construction vibrations and measures that will be implemented in the event that construction vibrations exceed the values included in this section.

4. A written description how to address and resolve vibration complaints, including but not limited to stopping pile driving and selecting a method of installation, subject to the Engineer's approval, that will not cause detrimental effects.

B. During construction, the Contractor shall submit weekly reports summarizing the previous weeks vibration monitoring.

PART 2 PRODUCTS

2.1 STEEL PILES

A. H-piles for supporting the Seawall shall be 40-foot-long HP10x57s conforming to ASTM A572, F_y = 50 ksi (min).

B. H-Piles for supporting the Timber Wharf shall be 40-foot-long HP10x42s conforming to ASTM A 572, F_y = 50 ksi. These H-piles are expected to be driven in segments that are spliced together due to overhead utility clearance constraints.

2.2 SPLICES FOR STEEL PILES

A. Design of pile splices shall be the responsibility of the Contractor unless otherwise shown on the Drawings. All splices shall be in conformance with AWS D1.1, and provide equal stress strain behavior in bending, tension, compression, and torsion of unspliced segments of piles. Submittals shall include the appropriate information contained in AWS D1.1, Part E, and shall include documentation establishing that each welder is currently qualified in the proposed welding procedure.

B. Pre-manufactured splices may be acceptable as shown on the Drawings, subject to the Engineer's review. The splice shall provide at least equal stress strain behavior in bending, tension, compression, and torsion of unspliced segments of piles.

C. In the event the splice becomes damaged so as to impair the pile from its intended use, replace the pile. All costs associated with replacement shall be borne by the Contractor.

D. No splices will be permitted until the Engineer has reviewed and accepted the Contractor's splice design and submittal information.

PART 3 EXECUTION

3.1 GENERAL

A. It shall be the Contractor's responsibility to ensure that the construction proceeds in a smooth and logical sequence and in a manner that will not cause any damage to or create excessive stresses or loads on existing or proposed structures.

3.2 PILE INSTALLATION EQUIPMENT

A. For H-Piles

The results of a Wave Equation Analysis completed by the Engineer indicate that hammers having the manufacturer's rated energy indicated in the Penetration Resistance Criteria Table may satisfactorily drive the H-piles to the specified tip elevation. The results assume that the hammer is delivering the transferred energy and impact stresses indicated, and the driving train is working efficiently and according to the manufacturer's recommendations.

PENETRATION RESISTANCE CRITERIA TABLE

Structure Location	Hammer	Estimated Ultimate Capacity (Kips)	Rated Energy (ft-lbs.)	Transferred Energy (ft-lbs.)	Max. Impact Stress (psi)	Penetration Resistance (blows/in)
Seawall	HPH 4500	360	32,560	20,490	41,540	5
Timber Wharf	HPH 2400	110	17,360	5,100	18,186	5

Notes:

1. The estimated ultimate capacity is the specified allowable capacity multiplied by a FOS of 2.75.
2. For the Seawall, the HPH 4500 hammer stroke was assumed to be set at 4.1 feet (max).
3. For the Timber Wharf, the HPH 2400 hammer stroke was assumed to be set at 2.0 feet.

1. The manufacturer's rated energy, transferred energy, impact stress, and estimated penetration resistance are included for information purposes only.

2. Hammer sizes and types are subject to the Engineer's review and approval. The Engineer will evaluate the Contractor's proposed driving equipment using Wave Equation Analyses. The criteria the Engineer will use will be the required

number of hammer blows per inch and the impact stress at the required ultimate capacity.

3. The required number of blows per inch at the ultimate capacity shall be between about 3 and 15 blows per inch. The pile stress during driving shall not exceed 90 percent of the pile yield stress.

4. If the Wave Equation Analyses indicates an inability to drive the piles to the ultimate capacity within the acceptable blow count range and below the acceptable stress level, change the proposed driving equipment. Submit changes to the Engineer for review and approval.

5. The driving cap or helmet shall seat into or on the pile and bear evenly upon the pile head and shall distribute the hammer blow uniformly throughout the cross section of the pile. The Engineer shall approve the driving cap or helmet.

6. Furnish the Engineer with the manufacturer's specifications and product and maintenance manuals for the hammer and auxiliary equipment prior to driving. Submit information on the proposed driving train and complete and submit the information on the Pile Hammer Data Sheet (Exhibit B).

3.3 LOCATIONS FOR DRIVING PILES

A. Layout the locations of the piles from the information shown on the Drawings and as furnished by the Engineer. The method used to determine pile locations shall be at the option of the Contractor.

3.4 PREPARATIONS PRIOR TO DRIVING PILES

A. Prior to driving the piles, the Contractor shall excavate, if required, to the proper elevations for making the connections shown on the Drawings. Any heave of the soil above the specified excavation shall be removed, at the Contractor's expense, before any backfill material is placed.

3.5 PILE SPLICING

A. Piles driven below cutoff elevation, piles with damaged heads that have been cut off to permit further driving, and piles that are too short to reach cutoff elevation shall be extended to the required cutoff elevation by welding on an additional length, as approved by the Engineer. Cutoffs shall become the property of the Contractor and shall be removed from the site at completion.

B. Splicing shall be made so as to produce a straight pile. Prior to installing the splice, square the end of the two sections of the pile to produce a straight splice with uniform bearing. In no case shall the ends of the pile sections be out of square by more than 1/16 inch.

C. All field splicing shall be performed in the presence of the Engineer. If pre-manufactured splicing or couplers are used, install according to the manufacturer's recommendations.

3.6 ACCURACY DRIVING PILES

A. Drive all piles to the specified alignment at the design position shown on the Drawings. After driving, each pile at cutoff elevation shall not vary by more than 2 inches horizontally from the design position shown on the Drawings. Deviation from

plumb for piles shall not exceed 1-percent of the pile length. Pulling or manipulation of the piles into alignment or position after driving shall not be permitted.

3.7 DRIVING PILES

A. Perform all driving in the presence of the Engineer. Notify the Engineer of intent to start work at least 5 days prior to the start of pile driving. Mark the piles at 1-foot intervals for purposes of recording the driving resistance and depth of penetration. Do not drive piles within 100 feet of freshly placed concrete which has not obtained its specified 28-day compressive strength. If two or more pile driving rigs are being used simultaneously, they shall be located a minimum of 150 feet apart. Followers shall not be used to drive piles.

B. Maintain and operate the driving equipment in accordance with the manufacturer's recommendations. Maintain the hammer concentric with the driving train in axial alignment of the pile. The hammer shall not be used to limit deviation of the pile during driving by exerting lateral forces or striking at an angle. The hammer and leads may be used to move and align the pile for the first 15 feet of driving before the pile has attained an initial set, unless the Engineer decides such movement may damage the pile. If damage to the pile head occurs during driving and the hammer can no longer strike the pile uniformly and axially, stop driving, provide a fresh cut at the head, and check the pile for proper fit.

C. The penetration resistance presented in the Penetration Resistance Criteria Table is based on conditions where the pile hammer is operating efficiently and according to the manufacturer's recommendations; the pile head is not damaged and fits as specified with the driving cap; and penetration is reasonably quick and uniform.

D. Drive piles continuously and without voluntary interruption, to termination penetration resistance or to practical refusal.

3.8 OBSERVATIONS DURING PILE DRIVING

A. Pile behavior during driving will be monitored by the Engineer. Provide the Engineer with suitable means or a device that will indicate the penetration of the pile from a reasonable and safe distance from the pile and driving leads. Allow the Engineer access to any pile driving information recorded by the Contractor.

3.9 OBSTRUCTIONS DURING DRIVING

A. Where obstructions are encountered that result in a sudden, unexpected increase in penetration resistance and deviation from the specific tolerances, the Contractor may be required to perform one of the following options.

1. Remove or drill through the obstruction.

2. Extraction, repositioning, and reinstallation.

3. Addition of extra piling.

B. Pursue the course of action selected by the Engineer. If, in the Engineer's opinion, the obstruction could not have been reasonably anticipated by the Contractor, work done under this Section, including necessary pile foundation modifications, will be considered for payment as a Change Order.

3.10 DAMAGED PILES

A. Any pile that is bent, ruptured, or damaged because of material or workmanship defects or by improper handling or installation, or which are otherwise damaged so as to impair it for its intended use, shall be removed and replaced or, where directed, a replacement pile shall be driven adjacent thereto.

3.11 INSPECTION OF DRIVEN PILES

A. The Engineer may require the Contractor to pull selected piles after driving for testing and inspection to determine the condition of the pile. Any pile so pulled and determined by the Engineer to be damaged so as to impair the pile from its intended use shall be removed from the work and a replacement pile driven at the Contractor's expense. Piles pulled and found to be sound and in satisfactory condition shall be re-driven. The cost for additional work associated with pulling and re-driving satisfactory piles shall be considered for payment as a Change Order.

3.12 ELEVATION OF CUTOFF

A. After installation, the upper end of the piles shall be cut square at the elevations shown on the Drawings.

3.13 VIBRATION MONITORING

A. Threshold and Limiting Value vibration criteria established by the Engineer are presented below. The Contractor shall be responsible for determining its means and methods for preventing the criteria presented below from being exceeded.

Structure	Sensor Location	Threshold Value (Peak Particle Velocity, in/sec)	Limiting Value (Peak Particle Velocity, in/sec)
Existing Seawall	Ground Surface Adjacent to Structure	0.50	1.0
Pump Station	Ground Surface Adjacent to Structure	0.50	1.0
Timber Framed Structures	Ground Surface Adjacent to Structure	0.30	0.50

B. If the Threshold Values shown are reached, the Contractor shall immediately notify the Engineer and meet to discuss a response action(s).

C. If the Limiting Values shown are reached, the Contractor shall stop work until a meeting takes place between the Contractor, Owner, and Engineer to assess the cause of the exceedance and develop a plan to prevent it from occurring again.

D. The Threshold Value vibration criteria shown above were established to help prevent minor damage from piling operations.

E. The sensors of the seismographs will be securely anchored into the ground by the Contractor. Sensors will be arranged so that one is in line with the vibration source and at the part of the structure nearest the source.

F. All costs borne by the Owner that result from the Contractor exceeding the maximum vibration levels as defined above, including but not limited to structure damage, shall be borne by the Contractor.

3.14 DISPOSAL OF EXCESS SEDIMENT AND SOIL

A. If excess material is generated that is unsuitable for reuse, the Contractor shall dispose of it offsite in accordance with all Local, State, and Federal Regulations.

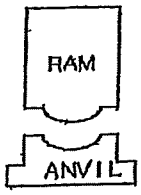
3.15 CLEANUP

A. The Subcontractor shall clean up all waste materials upon completion of the work specified herein.

END OF SECTION

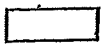
HAMMER DATA SHEET

Contract No.:	Structure Name and/or No.:
Project:	
Pile Driving CONTRACTOR or Subcontractor:	
County:	Piles Driven By:



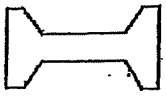
HAMMER

Manufacturer:	Model:
Type:	Serial No.
Rated Energy: @	Length of Stroke
Modifications:	



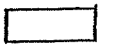
CAP BLOCK

Material:	
Thickness:	Area:
Modulus of Elasticity - E	(psi)
Coefficient of Restitution - e	



HELMET

ALL COMPONENTS	Weight:



CUSHION

Cushion Material:	
Thickness:	Area:
Modulus of Elasticity - E	(psi)
Coefficient of Restitution - e	

PILE

Pile Type:	Weight/ft
Length in Leads:	
Wall Thickness:	Taper:
Design Pile Capacity:	(Tons)
Description of Splice:	

Tip Treatment Description:

NOTE: If mandrel is used to drive pile, attach separate manufacturer's detail sheet(s), including weight and dimensions.

Submitted By: _____ Date: _____

SECTION 02368

TIMBER PILES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnishing and installing the timber piles, complete.

1.2 REFERENCES

A. The following is a list of standards which may be referenced in this section:

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

a. D25, Standard Specification for Round Timber Piles.

b. D2899, Methods for Establishing Design Stresses for Round Timber Piles.

2. American Wood Preservers Associates (AWPA):

a. C3, Piles – Preservative Treatment by Pressure Process

b. M2, Standard for Inspection of Treated Timber Products

c. M4, Standard for the Care of Preservative – Treated Wood Products.

d. M6, Brands used on Forest Products.

1.3 DEFINITIONS

A. Design Position: The location of the centroid of a pile at cutoff (x, y, and z coordinates) as shown on the Drawings.

B. Elevations: Referenced to the datum shown on Drawings.

C. Fixed Leads: Leads that are pinned to a crane boom at the top and equipped with a hydraulic spotter at the bottom that is capable of spotting the pile to its correct position and maintaining pile alignment during driving.

D. Impact Stress: Stress transferred to the pile head at impact from the driving train, as determined from a Wave Equation Analysis.

E. Obstruction: Sudden and significant increase of penetration resistance and deviation of pile out of tolerance resulting from encountering a subsurface or physical condition.

F. Practical Refusal: Penetration resistance of at least 120 blows per foot for 3 consecutive feet, 200 blows per foot for 1 foot, or 50 blows per inch for 2 consecutive inches, whichever occurs first, and to continue pile driving would be impractical. These criteria apply only to the hammer sizes and operation as specified.

G. Rated Hammer Energy:

1. Open End Diesel Hammers and Single Acting Air or Hydraulic Hammers: Product of rated stroke multiplied by ram weight.

2. Closed End Diesel Hammers and Double Acting Air or Hydraulic Hammers: Rated Energy from manufacturer's literature.

H. Set: Pile Penetration in inches per blow.

I. Sweep: Deviation from straightness measured along two perpendicular faces of pile while not subject to bending forces.

J. Swinging Leads: Pile driving leads that are not pinned at the top and do not have a hydraulic spotter to position the leads.

K. Termination Penetration Resistance: Penetration resistance (blows per foot) at which driving may be terminated, as established by the Owner/Engineer.

L. Transferred Hammer Energy: Energy transferred to the pile head from driving train impact, as determined from a Wave Equation Analysis

1.4 SUBMITTALS

A. Administrative Submittals: Production pile driving sequence.

B. Quality Control Submittals:

1. Plan providing pile identification numbers.

2. Weight certificate of hammerhead for drop hammers.

3. Manufacturer's literature for proposed equipment and procedures.

4. Preservative treatment inspection affidavit conforming to AWPA M2, stating type of preservative used and actual net retention.

5. Piling installer qualifications.

6. Proposed method(s) to align and maintain pile alignment, including type of leads to be used with details on methods and equipment to be used to measure alignment.

7. Manufacturer's specifications of products, and maintenance manuals, for pile hammer, and auxiliary equipment.

8. Complete Pile Hammer Data Sheet (See Exhibit B, Section 02301, STEEL H-PILES).

C. Contract Closeout Submittals

1. Pile Driving Log and Record: At end of each working day, submit two copies of each record to the Engineer for every pile constructed that day.

1.5 QUALIFICATIONS

A. Piling Installer: Minimum of 10 years of past successful experience with similar piling installation on at least 5 projects completed within the same time period.

1.6 STORAGE AND HANDLING

A. Protection

1. Store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather. Avoid breaking through treated

surfaces. Do not use pikes, cant hooks, pickets, tongs, or other pointed tools that dig into wood.

2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use.

3. Do not allow installation of damaged or otherwise non-complying material.

4. Use all means necessary to protect the installed work and materials of all other trades

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary as approved by the Owner/Engineer and at no additional cost to the Owner.

1.7 VIBRATION MONITORING

A. As specified in Section 02301, STEEL H-PILES.

PART 2 PRODUCTS

2.1 PRESSURE TREATED (PT) PILES

2 A. Pressure treated piles shall be 40-foot-long Douglas Fir or Southern Yellow Pine, and shall conform to the following minimum allowable stresses as determined in accordance with ASTM D-2899.

Compression Parallel to Grain (F_c) (psi)	**Bending (F_b) (psi)**	**Horizontal Shear (F_v) (psi)**	**Compression Perpendicular to Grain (F_{c1}) (psi)**
1,200	2,450	110	230

B. Pressure treated piles shall conform in general to the physical characteristics of round timber piles as described in ASTM D-25. Minimum top diameter shall be 12"; minimum toe diameter shall be 8".

C. Clearly and permanently brand the piles in two places approximately 5 and 10 feet from the top. The brand shall identify species, class and length, preservative, retention, supplier, and month and year of treatment.

D. Tops of cut-off piles shall be cut square, unless otherwise as shown on the Drawings.

2.2 PRESERVATIVE TREATMENT

2 A. Pressure treat PT piles to 2.5 PCF (min) with a salt-type chemical preservative, ammonia copper arsenate (ACA), or chromated copper arsenate (CCA), in accordance with AWPA C3. Douglas Fir shall be incised before treatment. Fabricate lumber and timbers as completely as possible before preservative treatment.

B. All drill holes, saw cuts, and abrasions made to pressure treated piles shall receive a field application of preservative equivalent in type to that originally used.

C. The tops of cut-off pressure treated piles and the ends of cut-off cap beams, stringers, and decking shall be treated in accordance with AWPA M4 (2% copper napthenate).

2.3 CONNECTIONS

A. Threaded rod, bolts, washers, and nuts for construction shall be as shown on the Drawings.

PART 3 EXECUTION

3.1 GENERAL

A. It shall be the Contractor's responsibility to ensure that the construction proceeds in a smooth and logical sequence and in a manner that will not cause any damage to or create excessive stresses or loads on existing or proposed structures.

3.2 PILE INSTALLATION EQUIPMENT

A. For Timber Support Piles

1. The results of a Wave Equation Analysis completed by the Engineer indicate that the hammer having the manufacturer's rated energy indicated in the Penetration Resistance Criteria Table may satisfactorily drive the timber support piles for supporting the Wharf to the specified tip elevation. The results assume that the hammer is delivering the transferred energy and impact stresses indicated, and the driving train is working efficiently and according to the manufacturer's recommendations.

2 PENETRATION RESISTANCE CRITERIA TABLE

Structure Location	Hammer	Estimated Ultimate Capacity (Kips)	Rated Energy (ft-lbs)	Transferred Energy (ft-lbs)	Impact Stress (psi)	Penetration Resistance (blows/in)
Timber Wharf	MKT 9B3	110	8,752	4,100	2,105	8

Notes:

1. The estimated ultimate capacity is the allowable capacity multiplied by a FOS of 2.75.
2. For the Timber Wharf, the MKT 9B3 hammer stroke was assumed to be set at 5.47 feet.

2. The manufacturer's rated energy, transferred energy, impact stress, and estimated penetration resistance are included for information purposes only.

3. Hammer sizes and types are subject to the Engineer's review and approval. The Engineer will evaluate the Contractor's proposed driving equipment using Wave Equation Analyses. The criteria the Engineer will use will be the required number of hammer blows per inch and the impact stress at the required ultimate capacity.

4. The required number of blows per inch at the ultimate capacity shall be between about 3 and 15 blows per inch. The pile stress during driving shall not exceed 90 percent of the pile yield stress.

5. If the Wave Equation Analyses indicates an inability to drive the piles to the ultimate capacity within the acceptable blow count range and below the acceptable stress level, change the proposed driving equipment. Submit changes to the Engineer for review and approval.

6. The driving cap or helmet shall seat into or on the pile and bear evenly upon the pile head and shall distribute the hammer blow uniformly throughout the cross section of the pile. The Engineer shall approve the driving cap or helmet.

7. Furnish the Engineer with the manufacturer's specifications and product and maintenance manuals for the hammer and auxiliary equipment prior to driving. Submit information on the proposed driving train and complete and submit the information on the Pile Hammer Data Sheet (See Exhibit B, Section 02301, STEEL H-PILES).

B. For Timber Fender Piles

1. Timber fender piles do not need to be installed to a specific capacity and may be driven to the tip elevations shown with a vibratory or impact hammer at the Contractor's discretion.

3.3 LOCATIONS FOR DRIVING

A. Layout the locations of the piles from the information shown on the Drawings and as furnished by the Engineer. The method used to determine pile locations shall be at the option of the Contractor.

3.4 PILE SPLICING

A. No timber pile splicing shall be allowed.

3.5 ACCURACY IN DRIVING

A. Within 1/4-inch per foot of pile length from the vertical design position for vertical piles.

B. Within 1/2-inch per foot of pile length from the required angle for batter piles.

C. Centroid of the piles at cutoff elevation shall not vary by more than 3 inches horizontally from the design position shown.

3.6 DRIVING

A. Perform all driving in the presence of the Owner/Engineer. Notify the Owner/Engineer of intent to start work at least 5 days prior to the start of pile driving. Mark piles at 1-foot intervals for purposes of recording driving resistance and depth of penetration of pile. Do not drive piles within 100 feet of freshly placed concrete which has not obtained its specified 28 day compressive strength. If two or more pile driving rigs are being used simultaneously, they shall be located a minimum of 150 feet apart. Followers may not be used to drive piles.

B. Maintain and operate the driving equipment in accordance with the manufacturer's recommendations. Maintain the hammer concentric with the driving train in axial alignment on the pile and as much as possible, drive piles continuously. The hammer shall not be used to limit deviation of the pile during driving by exerting lateral forces or striking at an angle. The hammer and leads may be used to move and align the pile in the first 15 feet of driving before the pile has attained an initial set, unless the

Owner/Engineer decides such movement may damage the pile. If damage to the pile head occurs during driving and the hammer can no longer strike the pile uniformly and axially, stop driving, provide a fresh cut at the head and check the pile for proper fit.

C. The penetration resistance presented in the Penetration Resistance Criteria Table is based on conditions where the hammer is operating efficiently and according to the manufacturer's recommendations; the pile is not damaged and fits as specified with the driving cap; and penetration is reasonably quick and uniform.

D. Drive piles continuously, and without voluntary interruption, to the specified tip elevation or to refusal, whichever occurs first.

3.7 OBSERVATIONS AND RECORDING OF PILE BEHAVIOR

A. Pile behavior during driving will be monitored by the Engineer. Provide the Engineer with a suitable means or device that will indicate the penetration of the pile from a reasonable and safe distance from the pile and driving leads. Allow the Engineer access to any pile driving information recorded by the Contractor.

3.8 OBSTRUCTIONS DURING DRIVING

A. Where obstructions are encountered that result in a sudden, unexpected increase in penetration resistance and deviation from the specified tolerances, the Contractor may be required to perform one of the following options:

1. Remove or drill through the obstruction.

2. Extraction, repositioning, and re-driving.

3. Addition of extra piling.

B. Pursue the course of action selected by the Engineer. If, in the Engineer's opinion, the obstruction could not have been reasonably anticipated by the Contractor, work done under this Section, including necessary pile modifications, will be considered for payment as a Change Order.

3.9 DAMAGED PILES

A. Any pile that is bent, ruptured or broken because of material or workmanship defects or by improper handling or driving, or which is otherwise damaged so as to impair it for its intended use, shall be removed and replaced or, where directed, a replacement pile shall be driven adjacent thereto.

3.10 INSPECTION OF DRIVEN PILES

A. The Engineer may require the Contractor to pull selected piles after driving for testing and inspection to determine the condition of the pile. Any pile so pulled and determined by the Engineer to be damaged so as to impair the pile from its intended use shall be removed from the work and a replacement driven at the Contractor's expense. Piles pulled and found to be sound and in satisfactory condition shall be re-driven. The cost for additional work associated with pulling and re-driving satisfactory piles shall be considered for payment as a Change Order.

3.11 ELEVATION OF CUTOFF

A. After driving, the upper end of the piles shall be cut as shown on the Drawings in an approved manner.

3.12 VIBRATION MONITORING

A. Vibration monitoring requirements and criteria shall be as specified in Section 02301, STEEL H-PILES.

3.13 CLEANUP

A. The Contractor shall clean up all waste materials upon completion of the work specified herein

END OF SECTION

SECTION 02457

DYNAMIC PILE TESTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work specified in this Section consists of furnishing all material, equipment, instrumentation, and labor to complete dynamic testing of selected piles, complete.

B. Dynamic monitoring will include CAPWAP analyses of designated piles that have been dynamically tested.

1.2 REFERENCES

A. The following is a list of standards that may be references in this section:

1. American Society of Testing and Materials (ASTM): D4945, Standard Test Method for High-Strain Dynamic Testing of Piles.

2. American Welding Society (AWS).

1.3 DEFINITIONS

A. High Strain Dynamic Testing (HSDT): Testing performed with Case-Goble Pile Driving Analyzer (PDA) to determine the drivability, pile toe and shaft friction, pile integrity, and hammer performance. Gauges are attached to pile approximately 3 feet below pile head and connected with cable to monitoring station on ground away from pile. Gauges consist of two accelerometers, two strain transducers, and junction box.

B. Impact Stress: Peak stress at pile head on impact from driving train as determined from measurements using pile driving analyzer.

C. Low Strain Dynamic Testing (LSDT): Test on test piles and production piles selected by the Engineer for quality control check of pile defects using low strain wave trace measurements. Test consists of checking the body of the pile for a uniform cross-section with no necking or contractions or other defects using low strain dynamic procedures.

D. Production Piles: Piles incorporated into the Work, utilizing a uniform selection of materials and workmanship, and which are determined acceptable by Engineer based on observations and indicator pile test results.

E. Indicator Piles: Piles constructed of same materials and workmanship, and installed as specified for production piles at production pile locations.

F. CAPWAP (Case Pile Wave Analysis Program) is a software program that determines total bearing capacity of the indicator pile, as well as resistance distribution along the shaft and at the toe. The program takes as input the recorded force and velocity data obtained with a PDA.

1.4 SUBMITTALS

A. Administrative and Quality Control Submittals:

1. Qualifications for testing instrumentation installer.

1.5 QUALIFICATIONS

A. Testing Instrumentation Installer: At least 3 years' experience in installation of the test pile instrumentation and current qualification (in accordance with AWS D1.1) to perform welding procedure(s) necessary to install instrumentation.

1.6 PRE-INSTALLATION MEETING

A. Discussion to include details and scheduling of indicator pile installation, testing, and test monitoring.

B. Attended by Contractor, testing agency, pile installation personnel, and Engineer, before starting Work specified under this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. As specified under Section 02301, STEEL H-PILES.

PART 2 PRODUCTS

2.1 INDICATOR PILE ORDER LENGTHS

A. Indicator Piles and Production Piles are considered the same for purposes of this work.

PART 3 EXECUTION

3.1 DYNAMIC TESTING LOCATION

A. Two (2) H-piles as shown on the Drawings shall be dynamically tested. These piles shall be dynamically tested during the initial drive and during the re-strike, which shall be performed 72 hours after the initial drive.

3.2 TEST PROCEDURES

A. In accordance with the referenced standards.

3.3 RECORD DATA

A. The record for each indicator pile driven and tested shall include the following:

1. High Strain Dynamic Testing Report in accordance with referenced standard for test performed.
2. Driving record.
3. Pile length.
4. Number of hammer blows-per-foot of penetration.
5. Resistance in blows-per-inch of last 12 inches of final driving.
6. Hammer stroke, and rate of operation during driving.
7. Unusual occurrence(s) during driving.

3.4 HIGH STRAIN DYNAMIC TESTING

A. Testing Equipment:

2

1. Contractor shall provide PDA and all ancillary equipment necessary to conduct the high strain dynamic testing and conforming to ASTM D4945.

B. Pile Driving Equipment:

1. Contractor shall use same hammer, driving system, and ancillary equipment to drive indicator piles and production piling. Maintain and operate driving equipment in accordance with manufacturer's instructions.

C. Indicator Pile Preparation: Contractor shall mark entire length of each indicator pile in accordance with Section 02301, STEEL H-PILES.

D. Estimated Activity Times:

1. Initial Gauge Installation: 30 to 60 minutes.

2. Re-strike Gauge Attachment: 30 to 60 minutes.

3. Dynamic Monitoring per Pile Driven: 30 minutes.

4. Removal of Gauges: 30 minutes.

E. Testing:

1. Performed in accordance with ASTM D4945.

F. Indicator Pile Installation:

1. In accordance with the requirements specified in Section 02301, STEEL H-PILES.

2. Maintain pile orientation during driving where pile orientation is essential:

a. Keep hammer concentric with driving train in axial alignment on pile.

b. Do not use hammer to limit deviation of pile during driving by exerting lateral forces or striking at an angle.

3. Terminate impact driving upon Engineer's request:

a. Indicator Piles shall be driven to the tip elevation shown on the Drawings.

b. Engineer will establish termination penetration resistance.

G. Initial and Re-Strike of Indicator Piles:

1. Contractor shall assist in conducting dynamic monitoring on all indicator piles during initial driving and during re-strike.

2. Minimum time between initial driving and re-strike shall be 72 hours.

3. Mount driving train on pile prior to attaching PDA gauges. Assist with gauge removal after completing the restrike but prior to removing pile driving train.

4. It is anticipated that re-striking will include a total of 20 to 30 hammer blows for each test pile.

H. CAPWAP Analysis:

1. Contractor shall be responsible for hiring the PDA testing Contractor and for having CAPWAP Analysis completed on selected piles.

2. Contractor will be responsible for establishing the final driving criteria for the production piles based on the PDA and CAPWAP results.

3.5 DAMAGED, MISPLACED, OR OTHERWISE REJECTED PILES

A. Indicator piles found damaged, necked, or otherwise unfit for use that are located at production pile locations shall be replaced.

B. Remove from site and replace with conforming piles

END OF SECTION

SECTION 03200

REINFORCING STEEL

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install reinforcement and associated items required for the cast-in-place concrete, complete.

1.2 REFERENCES

A. The latest editions of the following American Concrete Institute (ACI) publications shall be used as reference standards:

1. ACI SP-66 ACI Detailing Manual

2. ACI 301 Specifications for Structural Concrete for Buildings

3. ACI 318 Reinforced Concrete

B. The latest editions of the following American Society for Testing and Materials (ASTM) publications shall be used as reference standards:

1. ASTM A497 Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.

2. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

3. ASTM A775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

4. ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

1.3 SUBMITTALS

A. Submit the following:

1. Mill test reports for each shipment of reinforcement. Identify reports with specific lots in shipments and submit prior to use of reinforcement in work.

2. Chemical composition of reinforcing steel. Ladle analysis to identify percentage of carbon, phosphorous, manganese and sulfur present in steel.

3. Welder's certification in accordance with AWS D1.4 prior to welding, when welding is indicated or specified.

4. Shop and placement drawings to the Owner/Engineer for review prior to fabrication, which show:

a. All construction and expansion joints.

b. Reinforcement detailed in conformance with ACI SP-66.

c. Support bars and details of bar supports including type, size and spacing.

d. Marking for each reinforcement item.

5. Coating applicator's notarized Certificate of Compliance that the coating for rebar meets the specified requirements.

1.4 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect reinforcing steel before, during, and after installation and to protect the installed work and materials of all other trades.

2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

3. Use all necessary precautions to maintain identification after the bundles are broken.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner/Engineer and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 REINFORCING STEEL

A. All reinforcing steel shall be new, epoxy coated, free from rust, and comply with ASTM A-615, Grade 60.

B. Where epoxy coated rebar is shown or specified, the rebar shall be coated in accordance with ASTM A775.

C. Where epoxy coated rebar is shown or specified, repair damaged or cut ends with a touch-up field kit prior to pouring concrete.

2.2 OTHER MATERIALS

A. All other materials not specifically described but required for a complete and proper installation of reinforcing steel, shall be as selected by the Contractor subject to the approval of the Owner/Engineer.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

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

2. Verify that reinforcing steel may be installed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the original design.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Owner/Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 BENDING

A. General:

1. Fabricate all reinforcement in strict accordance with the approved Shop Drawings.

2. Do not use bars with kinks or bends not shown on the Drawings or on the approved Shop Drawings.

3. Do not bend or straighten steel in a manner that will damage the material

B. Design:

1. All bends shall be in accordance with ACI 318/. Bend all bars cold.

3.3 PLACING

A. General:

1. Before start of concrete placement, accurately place all reinforcing steel, positively securing and supporting by concrete blocks, metal chairs or spaces, or by metal hangers.

B. Splicing:

1. Horizontal Bars:

a. Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars in accordance with ACI 318.

b. Bars may be wired together at laps except at points of support of the member, at which points preserve the clear space described above.

c. Wherever possible, stagger the splices of adjacent bars.

C. Other Splices:

1. Make only those other splices that are indicated on the approved Shop Drawings or specifically approved by the Owner/Engineer.

D. Dowels:

1. Place all required steel dowels and securely anchor them into position before the concrete is placed. Dowels placed into existing concrete shall be securely anchored with high strength epoxy as indicated on the Drawings. Drilling and cleaning of dowel holes shall be in accordance with manufacturer's recommendations.

E. Obstructions:

1. In the event conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Engineer and obtain approval of new procedure before placing concrete.

F. Use pre-cast concrete bar support blocks for foundation mats.

3.4 MINIMUM COVER

A. Unless otherwise shown on the Drawings, provide the following minimum cover:

	Minimum Cover
Concrete cast against and permanently exposed to earth (e.g. footings)	3”
Stirrups, ties, and spirals	1 ½”
All other bars	2”

3.5 CLEANING REINFORCEMENT

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

END OF SECTION

SECTION 03310

CONCRETE

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work covered under this Section includes, but is not limited to, the furnishing of all plant, labor, equipment, appliances and materials including all joint fillers and sealants, and performing all operations in connection worth providing cast-in-place concrete in accordance with these specifications and in close conformity with the lines and grades shown

1.2 QUALITY CONTROL

A. As the work progresses, the Contractor shall be required to perform tests and/or engage a testing laboratory in order to confirm that the quality of the concrete will be in conformance with these Specifications. Concrete shall be sampled in accordance with Section 01400, QUALITY CONTROL.

B. Compression test specimens will be made by the Contractor and cured according to ASTM C31. Six (6) specimens will be collected for each 30 cubic yard pour at a structure and one (1) sample tested at 7 days, three (3) samples tested at 28 days, and two (2) samples held in reserve.

C. If the concrete is found to be substandard as a result of the initial testing, then any additional work for replacement or removal of the substandard concrete or retesting shall be at the Contractor's expense.

1.3 SUBMITTALS

A. Submit the following:

1. Batch plant details giving the location, layout, capacity, and type of batch plant and the method of transporting concrete from the batch plant to the work location. The Contractor shall provide documentation that all requirements of local authorities and regulations have been met.

2. Notification to the Engineer of concrete deliveries, a minimum of 24 hours in advance of the scheduled delivery. Include within this notification, class and quantity of concrete, frequency of trucks, and ordered slump.

3. Description of methods for cold-weather and hot weather batching, mixing and delivery.

4. Concrete Mix Designs.

a. Submit concrete mix designs to the Engineer within a minimum of fourteen (14) calendar days prior to placement. Include a complete list of materials including admixtures, applicable reference specifications, and copies of test reports showing the mix has been successfully tested to produce the properties specified.

b. For each design mix, provide:

1) Certifications by the concrete supplier that ingredients conform to the specified requirements.

2) Certifications by the concrete supplier that design mix conforms to specified strength, unit weight, maximum size aggregate, air entrainment, slump and to be free of soluble chloride content.

3) Coarse aggregate gradation, specific gravity, and dry rodded unit weight.

4) Identify admixtures, and planned dosage rate.

5. Compression test results.

PART 2 PRODUCTS

2.1 CEMENT

A. Cement shall conform to ASTM C150, Type II. The tricalcium aluminate (C3A) content shall not be less than 4 percent to provide protection for the reinforcement and shall not be more than 10 percent to obtain concrete that is resistant to sulfate attack.

2.2 FLY ASH

A. Fly ash shall comply with ASTM C 618, Type F; except that the maximum calcium oxide content shall be 8 percent, the maximum available alkalis shall be 1.5 percent, and the maximum allowable loss on ignition shall be 6 percent. Report the chemical analysis of the fly ash in accordance with ASTM C311. Evaluate and classify fly ash in accordance with ASTM D 5759. If Fly ash is utilized to improve the concrete properties, its content shall not exceed 20 percent by weight of the total cementitious material.

2.3 GRANULATED BLAST FURNACE SLAG

A. Slag shall be finely ground, hydraulic cement, produced from granulated blast furnace slag, a product of the iron making process. It shall conform to ASTM C 989-99 as manufactured by Lafarge Newcem or approved equal. If Slag is utilized to improve the concrete properties, its content shall not exceed 40 percent by weight of the total cementitious material.

2.4 MICROSILICA

A. Microsilica shall be Force 10,000 as manufactured by Grace Construction Products or approved equal. If Microsilica is utilized to improve the concrete properties, its content shall not exceed 10 percent by weight of the total cementitious material

2.5 AGGREGATES

A. Aggregates shall conform to ASTM C33, except as modified herein:

1. The combined aggregates in the mixture (coarse, fine, and blending sizes) shall be well graded from coarse to the fine with not more than 18 percent nor less than 8 percent, unless otherwise permitted, of the combined aggregate retained on any individual sieve, with the exception that:

a. The No. 50 may have less than 8 percent retained;

b. Sieves finer than No. 50 shall have less than 8 percent retained; and

c. The coarsest sieve may have less than 8 percent retained.

d. Use blending sizes where necessary to provide a well graded combined aggregate. Reports of individual aggregates shall include standard concrete aggregate sieve sizes including 1-1/2", 1", 3/4", 1/2", 3/8", No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100.

B. Provide aggregates for exposed concrete from one source. Do not provide aggregates that react deleteriously with alkalies in cement. Refer to Appendix Paragraph entitled "TEST METHOD C227" of ASTM C33 for expansion limits. Provide aggregate containing no deleterious material properties as identified by ASTM C295.

C. Aggregate, when subjected to five (5) cycles of the soundness test in accordance with ASTM C88, shall not have a loss greater than 10 percent when sodium sulfate is used.

D. Where a size designation is indicated, the designation indicates the nominal maximum size of the coarse aggregate.

E. Where historical data is used, provide aggregates from the same sources and having the same size ranges as those used in the concrete represented by historical data

2.6 WATER

A. Water shall comply with the requirements of ASTM C 94 and the chloride and sulfate limits in accordance with ASTM D 512 and ASTM D 516. Mixing water shall not contain more than 500 parts per million of chlorides as Cl and not more than 100 parts per million of sulfates as SO4. Minimize the amount of water in the mix. Water shall be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

2.7 CONCRETE

A. Concrete for this project shall be a high-performance mix conforming to Section 520 of the Standard Specifications and proportioned based on Class AAA of the Standard Specifications as shown in Table 1.

Table 1

Concrete Proportioning

Concrete Property	Seawalls	Other
Minimum 28-Day Compressive Strength per AASHTO T23 (psi)	5,000	--
Slump per AASHTO T119 (in)[1]	2 – 4 [2]	--
Air Content per AASHTO T152 (%)	5.0 - 8.0	--
Minimum Cementitious Content (lb/yd^3)	705	--
Maximum Cementitious Content (lb/yd^3)	799	--

Maximum Water/Cementitious Ratio by Mass	0.40	--
Maximum Aggregate Size (in)	3/4	--

Footnotes:

[1] The slump range shall be measured at the point of discharge. The Contractor shall submit the target slump range for each mix design to the Engineer for approval.

[2] Slump shall not exceed 4 inches for surfaces sloped greater than 4 percent. If additional workability is desired, the Contractor may propose to increase the maximum specified slump up to 6 inches if an AASHTO M 194 Type A – Water Reducing Admixture is used, or up to 9 inches if an AASHTO M 194 Type F or G – High Range Water Reducing Admixture is used. AASHTO M 194 Type F or G – High Range Water Reducing Admixture is required when concrete is to be placed by pumping equipment. Admixtures shall be utilized in accordance with the manufacturers' recommended dosages.

[3] The Contractor shall achieve the specified slump using an AASHTO M 194 Type A – Water Reducing Admixture, or an AASHTO M 194 Type F or G – High Range Water Reducing Admixture. AASHTO M 194 Type F or G – High Range Water Reducing Admixture is required when concrete is to be placed by pumping equipment. Admixtures shall be utilized in accordance with the manufacturers' recommended dosages.

2.8 PERFORMED JOINT FILLER

A. Preformed joint filler shall be extruded closed cell polyethylene foam as manufactured/supplied by Foamtech or approved equal.

2.9 POLYURETHANE JOINT SEALANT

A. Polyurethane joint sealant shall be Sikaflex-1a as manufactured/supplied by Sika or approved equal.

2.10 BONDING AGENTS

A. Bonding agent shall be SIKAFLEX-Armatec® 110 EpoCem®, as manufactured by SIKA or approved equal. Apply in accordance with the manufacturer's instructions.

2.11 NON-SHRINK GROUT

A. Non-Shrink Grout for grouting the vertical joints at the weep drains shall be Sika 212 and supplied/manufactured by Sika Corp. or approved equal.

2

2.12 FAST SETTING MORTAR

A. Fast Setting Mortar for setting granite blocks and cap stones shall be 5-Star Structural Concrete V/O, as manufactured/supplied by 5-Star Products, Inc. or approved equal. Apply in accordance with the manufacturer's instructions, and allow mortar to set a minimum of 24 hours prior to pouring the concrete stem wall.

2.13 EPOXY GROUT

A. Epoxy grout for setting anchors or rebar shall be Hilti HIT-RE 500 V3 by Hilti America or approved equal. Apply in accordance with the manufacturer's instructions.

PART 3 EXECUTION

3.1 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

A. Before placement, all equipment for mixing and transporting the concrete shall be cleaned, and all debris and ice shall be removed from the places to be occupied by the concrete. Forms shall be thoroughly wetted (except in freezing weather) or oiled. The reinforcement shall be thoroughly cleaned of ice, dirt, rust scale or other deleterious coatings.

3.2 PLACING CONCRETE

A. Concrete shall be placed only when the Engineer is present.

B. Concrete work shall be in accordance with ACI 318 Building Code Requirements for Reinforced Concrete, latest edition.

C. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. The placing of concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily. No concrete that has been contaminated by foreign material shall be used nor shall re-tempered concrete be used.

D. Do not exceed a free vertical drop of 3 feet from the point of discharge.

E. Concrete delivery trucks shall not have aluminum chutes. All chutes shall be round-bottomed.

F. When placing is started, it shall be carried on as a continuous operation until placement is completed.

G. All concrete shall be thoroughly consolidated during placement by vibration or other approved means. It shall be thoroughly worked around embedded fixtures and into the corners of the forms.

3.3 VIBRATING CONCRETE

A. Vibration of concrete shall comply with the requirements of ACI 301, ACI 309R, and ASTM A775 for epoxy-coated bar using vibrators with a minimum frequency of 9000 vibrations per minute (VPM). Use only high cycle or high frequency vibrators. Motor-in-head 60 cycle vibrators may not be used.

B. For walls and deep beams, use a minimum of two vibrators with the first to melt down the mixture and the second to thoroughly consolidate the mass. Furnish a spare, working, vibrator on the job site whenever concrete is placed.

C. Operate internal vibrators with the vibratory element submerged in the concrete. Do not use vibrators to transport the concrete in the forms.

D. Place concrete in 18” maximum vertical lifts. Insert and withdraw vibrators approximately 18” apart. Penetrate at least 8” into the previously placed lift with the vibrator when more than one lift is required. Extract the vibrator using a series of up and down motions to drive the trapped air out of the concrete and from between the concrete and the forms.

E. External vibrators shall be used on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

F. For slab construction, use vibrating screeds designed to consolidate the full depth of the concrete.

G. Where beams and slabs intersect, use an internal vibrator to consolidate the beam.

H. Do not vibrate concrete placed with anti-washout admixtures.

I. Vibrators shall be equipped with rubber vibrator heads.

3.4 COLD WEATHER REQUIREMENTS

A. Proceed in accordance with ACI 306.1. Unless otherwise approved, the temperature of the mixed concrete shall be not less than 50º F and not more than 90º F at the time of placing it in the forms. Obtain approval prior to placing concrete when the ambient temperature is below 40º F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 60º F minimum for a minimum of 5 days after placing the concrete, and above 40º F for an additional 9 days. The temperature shall then be gradually lowered to that of the surrounding atmosphere.

3.5 HOT WEATHER REQUIREMENTS

A. Placement of concrete in hot weather shall be performed in accordance with ACI 305R. Maintain required concrete temperature using Figure 2.1.5, "EFFECT OF CONCRETE TEMPERATURES, RELATIVE HUMIDITY, AND WIND VELOCITY ON THE RATE OF EVAPORATION OF SURFACE MOISTURE FROM CONCRETE" in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.6 FORMS

A. Forms shall conform to shapes, lines and dimensions of the members as called for on the Drawings and shall be sufficiently tight to prevent leakage of concrete. They shall be properly braced or tied together so as to maintain position and shape.

B. Forms shall be removed in such a manner as to ensure the complete safety of the structure. In no case shall supporting forms or shoring be removed until members have acquired sufficient strength to support their weight and imposed loads safely.

3.7 JOINTS

A. Construction Joints: Concrete shall be installed to the limits indicated with the use of construction joints as shown on the Drawings or as approved by the Engineer. Additional construction joints, other than those indicated on the Drawings, shall not be incorporated into the work without the approval of the Engineer.

B. All concrete between consecutive joints shall be placed in a continuous operation.

C. Thoroughly clean the surface of the concrete at construction joints and remove laitance prior to placing adjoining concrete.

D. Apply a bonding agent to surface of hardened concrete in accordance with the manufacturer's requirements prior to placing adjoining concrete.

3.8 CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of cap and other similar surfaces. If forms remain during curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure all unformed surfaces.

D. Evaporation Retarder: Apply evaporation retarder to uniformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding and bull floating or darbying concrete, but before float finishing.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods.

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 EXPOSED EDGES

A. All exposed edge and reentrant corners not otherwise detailed on the Drawings shall have a minimum ¾" chamfer.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Use patching mortar to repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to the Engineer's satisfaction.

B. Repairing Formed Surfaces: Repair and patch all voids at form ties and all surface defects including color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, remove snap-tie cones, cut out honeycombs, rock pockets, and voids more than ½ inch (13mm) in any dimension in solid concrete, but not less than 1 inch (25mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat all holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

3.11 FINISH

A. Concrete shall receive a smooth form finish as follows:

1. Use form facing materials that will produce a smooth, hard, and uniform texture on the concrete.

2. Arrange facing materials in an orderly, symmetrical manner, with a minimum number of seams.

3. Limit form face deflection.

4. Avoid the use of defective or damaged materials that will impair the concrete surface texture.

B. The smooth form finish shall provide a neat and uniform appearance and provide a smooth and non-abrasive surface.

C. Exposed concrete that will receive foot traffic will receive a non-skid broom finish

END OF SECTION

SECTION 04400

STONE MASONRY

PART 1 GENERAL

1.1 REFERENCES

A. Refer to other divisions of these specifications, other sections in this division, and Drawings for related work, which may affect the work of this section.

B. The Contract Documents indicate and show the limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.

1.2 DESCRIPTION OF WORK

A. Work Included: The Contractor shall provide all labor, materials, and equipment necessary to complete the Work of this Section, including but not limited to the following:

1. Stone masonry work related to the construction of the seawall.

1.3 SUBMITTALS

A. For any imported granite blocks and fascia stones that are not reused from the site or that are stockpiled in the DPW's yard, the Contractor shall provide a sample of the proposed stone, including example cuts or splits that may be made in order to complete the work. The sample shall be a minimum of 1' x 1' x 2', and shall be delivered to the project site for approval by the Owner/Engineer.

B. The Contractor shall provide a letter from the proposed stone quarry that will be supplying imported stone, certifying that it has the capacity and quantity of material to completely satisfy the project requirements.

1.4 QUALITY ASSURANCE

A. The Contractor shall provide a qualified stone mason to supervise the selection, fitting, working and placement of all stonework meeting these specifications and the intent of the project. If the Contractor is not experienced in stone masonry, it shall employ a stone mason to supervise stone placement and ensure quality stonework construction.

B. The Contractor shall not switch sources of imported stone without submitting a new sample for written approval by the Owner/Engineer.

1.5 DELIVERY AND STORAGE

The Contractor shall provide a qualified stone mason to supervise the selection, fitting, working and placement of all stonework meeting these specifications and the intent of the project. If the Contractor is not experienced in stone masonry, it shall employ a stone mason to supervise stone placements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stone

1. Finish cap stones shall be gray granite of size and finished as indicated.

2. Granite fascia for sheet pile facing shall be gray granite, saw cut top and bottom, split face.

2 3. Exposed face of stones shall be of uniform dimensions.

2 4. All wall stone shall be hard, durable, angular igneous rock (granite, diorite or similar) with a shape consistent with building a stable block stone wall. The stone shall have at least 3 relatively flat faces and shall preferably be in a slab or block form. The stone shall be free of oil, grease, paint or other bond inhibiting deposits. Salvaged granite wall stones from other projects are stockpiled at the City DPW's yard and are to be used as first priority prior to procurement of new stone. However, the Contractor is responsible for loading, transporting, and unloading the stone, and for any preparation or cleanup of the stones as required. Granite blocks from the existing seawall may also be reused, except for those that are from the native Kittery formation. These stones shall be separated and shall be hauled and stockpiled in the DPW's yard.

5. Stones with cracks or soft seams shall be considered as separate blocks, assuming that frost action will eventually open the cracks. Rounded stones will not be accepted. Stones shall be dimensioned as shown on the Drawings and exposed faces shall be selected and placed to show the straightest, flattest face(s) free of defects to the extent possible. Cap stones shall be selected to be free of longitudinal cracks and have a relatively flat top surface with no more than 0.5 inches of vertical variation upon final placement.

6. Stones from the existing seawall that are reused shall be cleaned by pressure washing, including removal of seaweed/marine growth, in order to enhance bonding between the stones and concrete/mortar.

B. Chinking Stone

1. Chinking stone shall be of the same quality as the wall stone and be selected to best match the size and shape of the voids/gaps beings filled. The Contractor shall provide and maintain an adequate supply of chinking stone at the work site to allow for stone size and shape selection.

C. Mortar/Concrete

1. Refer Section 03310, CONCRETE.

PART 3 EXECUTION

2 A. The wall construction shall be as indicated on the Drawings, with neat tight stone placement. Exposed stones shall be selected and placed to show the straightest, flattest face(s), and shall be free of defects to the greatest extent possible. Joints between stones shall not have gaps greater than 1".

B. Unless otherwise noted, the vertical joints between stones shall be staggered at least 12 inches between adjacent courses to provide optimum interlocking. Unless otherwise shown, only stone shall be exposed along the face and top of the seawall – footing and retaining wall concrete shall not be visible above mean lower low water or above the existing mudline. Stones shall not protrude more than 2" beyond adjacent stones at the joints and all working of exposed stone shall be by chipping (i.e., no exposed saw cut or grinder surfaces, or exposed drill holes over 3/4" diameter shall be visible).

2 C. The Contractor shall make provisions to prevent concrete from seeping through the joints in the granite block facing during concrete pours.

Within two hours of placing concrete, the back side of the seawall stones shall be scrub-coated with a Portland cement/water slurry mixed to a pancake batter consistency. All stones shall be solidly placed and interlocked and any stone placement that allows a stone to rock or move by hand or foot pressure shall be reset. The Contractor shall be responsible for maintaining the stability of the stones by placing concrete in lifts and providing temporary shoring as required. Stones shall be adequately placed or braced to allow concrete consolidation using a vibrator. Concrete surfaces between lifts shall be kept rough and irregular to ensure a high friction bonded surface between lifts.

END OF SECTION

Tighe&Bond

ATTACHMENT 6