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NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
COAL POCKET PIER RECONSTRUCTION AND FISHING PIER REPAIRS
NEW BEDFORD, MASSACHUSETTS

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SECTION 01000

GENERAL INSTRUCTIONS

1. SCOPE

The work covered under this project consist of the furnishing of all plant, labor, equipment, hardware and materials, for the Coal Pocket Pier Reconstruction and Fishing Pier Repairs, New Bedford, Massachusetts, complete in strict accordance with Specifications and accompanying drawings and subject to all terms and conditions of contract.

2. DESCRIPTION

The scope of work of the project is provided on Sheet 1.0 – Notes and Legends of the Contract Drawings. The BASE BID is comprised of the repairs at the locations described below.

A. Coal Pocket Pier: The scope of work includes the mobilization of equipment and personnel to the jobsite, the removal and disposal of the following: The timber pile supported pier (including decking, timber piles, utilities, framing, and fasteners), concrete headwall at the landside connection at the existing pier, the fender piles located along the stone masonry wall and along the existing pier, the existing bituminous pavement within the limits indicated in the Contract Drawings; the installation of a new concrete headwall at the landside connection of the pier, the installation of a new timber pier including support piles, pile caps, stringers, decking, PVC conduit, fender piles, wales, chocks, timber curbs, and timber camels; the installation of fender piles, wales, and chocks, along the stone masonry wall, and full depth pavement replacement within the limits indicated in the Contract Drawings.

B. Steamship Pier: The scope of work includes the mobilization of equipment and personnel to the jobsite; the removal of broken fender piles indicated on the Contract Drawings, the installation of new fender piles and fender components, the installation of two “sistered” support piles; and the installation of concrete filled fiberglass pile encasements.

C. Leondard’s Wharf: The scope of work includes the mobilization of equipment and personnel to the jobsite; the removal and disposal of pavement to the approximate limits shown on the Drawings; excavation to expose the internal wale; the removal and replacement of the internal wale fixing bolts/hardware; backfilling and compaction of the excavation; and the replacement and patching of the removed asphalt pavement.

3. WORK COMMENCEMENT

A. Contractors are advised that mobilization is to commence a maximum of 10 days after Contract Award or as otherwise agreed in writing by the Owner.

B. The Contractor is to make every effort to ensure that sufficient materials and equipment are delivered to site in a prompt and orderly fashion.

4. DATUM

A. Datum used for this project is Mean Low Water (MLW).

B. Bidders are advised to consult the Tide Tables issued by NOAA in to keep informed of the tidal condition affecting work.

5. EXAMINATION OF SITE

A. Parties intending to bid for this work are advised to visit site and make their own estimates of facilities and difficulties attending execution of work, actual site and soil conditions, severity, exposure and uncertainty of weather, fishing vessel staging, and all other issues associated with the work.

B. The Contractor shall study the drawings and compare the same with the information gathered during his examination of the sites, as no extra compensation will be authorized for extra work caused by his unfamiliarity with the sites(s) and/or drawings or the conditions peculiar to this job.

6. WORK SCHEDULE

A. Immediately upon award of contract, the Contractor shall submit a schedule of work to the Engineer on forms provided for that purpose. All entries contained in unit price schedule will be entered on form. Each entry will show an intended start and completion date using a horizontal bar graph method. No work will commence until this schedule has been reviewed and approved by the Engineer or Owner.

B. Should the Contractor find that they cannot maintain schedule as originally intended, the Contractor shall immediately submit a revised schedule without being requested to do so by the Engineer.

7. LAYOUT OF WORK

A. Contractor shall lay out work on ground to satisfaction of the Engineer using base and datum information shown on Drawings or as requested by the Engineer.

8. SITE OPERATIONS

A. Arrange for sufficient space adjacent to project site for conducting operations and storage of materials. Exercise care so as not to obstruct or damage public or private property in area. Do not interfere with normal day to day operations adjacent to site. All arrangements for space and access will be made by the Contractor as approved by the Engineer or Owner.

B. The Contractor shall clean-up and restore all disturbed areas each week and every week throughout the duration of the project.

C. Materials and/or equipment stockpiled on site shall be done so in a manner to protect existing pavement, grassed areas, and site improvements. Contractor shall coordinate location of material staging area and protection measures with the Engineer prior to commencing the work.

D. At completion of work, restore area to its original condition. Damage to ground and property will be repaired by the Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to the Engineer.

E. Work Hours shall be limited to avoid disturbance to local residents and businesses.

9. PROJECT MEETINGS

A. Engineer will arrange all project meetings.

B. All project meetings will take place on site of work unless so directed by the Engineer.

C. Contractor will have a responsible member of their firm present at all project meetings.

10. PROTECTION

A. The area designated for storage of materials and equipment shall be approved by the Engineer and Owner during the Pre-Construction Meeting.

B. Take necessary precautions to prevent damage by any means to all materials and equipment to be incorporated into work that are stored on site.

C. Repair or replace all materials or equipment damaged in transit or storage to the satisfaction of and at no cost to the Engineer or Owner.

11. EXISTING SERVICES

A. Before commencing work, establish locations and extent of any service lines in area of work and notify Engineer of findings.

B. Submit schedule to and obtain approval from Engineer for any shutdown or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

C. Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

D. Record locations of maintained, re-routed and abandoned service lines.

12. DOCUMENTS REQUIRED AND PHOTOGRAPHS

A. Maintain at job site, one copy each of following:

1. Contract drawings
2. Specifications
3. Addenda
4. Reviewed shop drawings
5. Change orders
6. Other modifications to Contract
7. Field test reports
8. Copy of approved work schedule.

B. Photographs

1. The Contractor shall, at its own expense, furnish the Engineer with suitable electronic digital color photographs of the project. Photographs will be scheduled at low tide to reveal as many site features as possible.

2. A minimum of twenty-four (24) views will be required and shall be taken at each location as follows:

   a. Before the project has started.
   b. After the project has been completed.
   c. Every week of construction activity.

13. TAXES AND PERMITS

A. Contractor shall pay applicable federal, state and municipal taxes.

B. If required, Contractor shall pay for applicable permits.

14. REGULATORY REQUIREMENTS

A. Contractor shall be responsible for performing all work in accordance with regulatory approval requirements. The Orders of Conditions shall be provided when received.

B. The Contractor shall provide and maintain a debris boom and curtain, secured around the work area to prevent debris from entering the water during demolition operations.

15. CONSTRUCTION SCHEDULES AND SUBMITTALS

A. Unless otherwise specified, within ten (10) calendar days from the notice to proceed the Contractor shall submit to the Engineer a schedule of work tasks. In addition, the Contractor shall submit a complete breakdown of all items that shall be paid for under this Contract in a lump sum manner. This breakdown shall show all relative costs to the item as bid, such as the cost of material, labor, mobilization and demobilization, survey and all incidentals to the item.

B. A construction schedule shall be maintained on the project for review during site meetings. If a major change is made to the schedule, three (3) copies of the updated schedule shall be submitted to the Engineer immediately.

C. Claims for scheduling delays caused by adverse weather conditions will not be considered.

D. Shop Drawings shall be submitted to the Engineer for review as required by the Specifications. Contractor shall submit number of required drawings plus three (3) for retention of the Engineer.

E. At completion of work, deliver completed record documents to the Owner. Final payment for project will not be made until the Owner reviews and approves these documents.

16. CONSTRUCTION FACILITIES

A. Provide and maintain temporary sanitary facilities. Existing facilities shall not be used unless permitted prior to the start of work.

17. MEASUREMENT AND PAYMENT

A. Coordination work herein shall be included under Contract Item 01001-1 – MOBILIZATION AND DEMOBILIZATION.

18. ATTACHMENTS

A. See Appendices

END OF SECTION

SECTION 01001

MOBILIZATION AND DEMOBILIZATION

PART 1 GENERAL

1.01 WORK INCLUDED

This item shall consist of all administrative and overhead cost; preparatory work; operations; and testing; including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of Contractor's field facilities, signage, buildings, and other facilities and accessories (floats, jon boat, job lighting and power, firefighting provisions, etc.), environmental requirements consistent with the permits necessary for work on the project, and all other work and operations which must be performed or for costs which must be incurred prior to beginning work. All services and materials specified in 01000 GENERAL INSTRUCTIONS shall also be included for payment under this Item.

1.02 SUBMITTALS

A. Submittals for work items shall be in accordance with Section 01000 – General Instructions.

PART 2 PRODUCTS

2.01 GENERAL

A. Products shall be as required and as specified in other sections.

PART 3 EXECUTION

3.01 SITE PREPARATION AND RESTORATION

A. Contractor shall provide site access as required for the transport of materials, personnel and equipment to the project site.

B. Contractor shall remove all materials used for access and restore all areas to their pre-construction condition.

C. Contractor shall provide measures to prevent demolition materials from entering the bay, including placement of turbidity booms.

D. Excess material shall be removed from the site and become the property of the Contractor.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. MOB/DEMOB (MOBILIZATION AND DEMOBILIZATION) shall be measured as a lump sum with the percentage of MOB/DEMOB complete measured by the Engineer. Total payment under this item shall be less than 20 percent of the total contract amount bid.

B. Following mobilization of equipment on site and approval of shop drawings, the Contractor can invoice for 20 percent of this item. Following completion of 40 percent of the work under the Contract, the Contractor may invoice 65 percent (45 percent more) of this item. Following completion of all work under this item, the Contractor can invoice the remaining 35 percent of this item.

4.02 PAYMENT

A. MOB/DEMOB shall be paid for under Contract Item 01001-1 for the percentage of site preparation complete, which price shall include, Item 01500 TEMPORARY FACILITIES, all material, equipment, labor, submittals, and other incidental or appurtenant work required to complete mobilization and demobilization, demolition operations, site restoration and site preparation as shown on the Drawings, trash boom and silt curtain, erosion control, cost associated with environmental permit compliance, as specified herein, and as directed by the Engineer.

B. Payment Items

ITEM	DESCRIPTION	UNIT PRICE
01001-1	MOB/DEMOB	LUMP SUM

END OF SECTION

SECTION 01500

TEMPORARY FACILITES AND CONTROLS

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the GENERAL INSTRUCTIONS which is hereby made a part of this Section of the Specifications.

1.02 REQUIREMENTS INCLUDED

A. Temporary Facilities and Controls including the following:
1. Temporary Water.
2. Weather Protection.
3. Temporary Power.
4. Hoisting Equipment and Machinery.
5. Staging.
6. Maintenance of Access.
7. Dust Control.
8. Noise Control.
9. Enclosures.
10. Cleaning During Construction.
11. Field Offices.
12. Sanitary Facilities.
13. Construction Barriers.
14. Parking.
15. Debris Control and Removal.
16. Safety Protection.
17. Vehicle and Equipment Protection.
18. Shoring.
19. Construction Fence.
20. Project Identification Sign.

1.03 TEMPORARY WATER

A. Water, if required, shall be furnished by the Contractor.

B. Water shall be distributed by means of connections to the permanent service lines that are to be installed at the expense of the Contractor.

C. Any temporary hoses and pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the Contractor

and the Contractor's Subcontractors shall be installed, protected, and maintained at the expense of the Plumbing Subcontractor.

D. Temporary hoses and temporary pipe lines used for transporting water shall not be run unattended or unprotected across streets, parking areas, parking area entrances, walkways, plazas, or steps.

E. The Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

F. Use of the water may be discontinued by the NHC/City of New Bedford if, in the opinion of the Engineer or Owner, it is wastefully used.

1.04 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the winter months. Under no circumstances shall the Contractor suspend any work during the months of this time because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Engineer. Included in the preceding category, without limitation, are such items as site work, excavation, timber erection, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during winter months as determined by the Engineer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 50 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract with added regard to performance obligations of the Contractor.

C. The cost of providing and installing weather protection is the responsibility of the Contractor. Additional work or time spent installing the weather protection shall not be eligible for additional payment.

D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

1.05 TEMPORARY POWER

A. The utility company may provide electrical energy required for temporary light and power. If requested by the Contractor and approved by the Owner/Town, the Contractor may provide temporary feeders of sufficient capacity from the local utility company, or from power lines, for the electric light and power requirements of the project while under construction. It is not the intent of the above statement to relieve the Contractor of the responsibility of payment for energy consumed during construction, but rather to afford him use of permanent feeder, etc. for electric distribution during construction. Payment for energy consumed during construction shall be the responsibility of the Contractor.

B. The Contractor shall pay for the cost of electric energy consumed by himself and by all of the Contractor's Subcontractors. Any temporary wiring of a special nature shall be paid for by the Contractor requiring it, such as:

1. Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-amperage and/or special voltage service, etc.
2. Exterior lighting circuits for protection against vandalism, public warning lights, lights for advertising, and similar items.

C. The Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them. The Contractor shall pay for the offices of the Contractor and the Engineer.

D. All temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose. Use copper wire only.

E. All relocations of temporary service to meet construction and/or phasing requirements shall be performed at no additional cost to the Owner.

1.06 STAGING

A. All staging, planking and scaffolding, exterior and interior, required for the proper execution of the work and over eight feet in height, shall be furnished, installed, and maintained by the Contractor.

1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.
2. Copies of such certifications, clearly indicating qualifications, shall be provided to the Engineer prior to commencement of such erecting and dismantling work.

B. All staging up to eight feet in height shall be provided by the individual Subcontractors as applicable to their work.

1.08 MAINTENANCE OF ACCESS

A. The Contractor shall provide and maintain for the duration of the Contract, a means of access to, around and within the site, as indicated on the Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The Contractor shall, without additional compensation from the Owner, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Engineer.

B. The Contractor shall fully cordon off the work area to prevent public access. Approximate locations of signage and the limits of security fencing are indicated on the Drawings. All signage shall be installed prior to the start of any work at the site.

C. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.

1.09 DUST CONTROL

A. The Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract with added regard to performance obligations of the Contractor.

1.10 NOISE CONTROL

A. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers, and power equipment with mufflers.
2. Manage vehicular traffic and scheduling to reduce noise.

3. No heavy equipment may be started or idled before 7A.M.

1.11 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. All utilities including electric ducts, conduits, telephone lines, sprinklers, and other utilities shall be protected against damage from construction activity. The Contractor shall be responsible for all damage to the utilities from construction and shall repair all such damage at no additional cost to the Owner.

1.12 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various Sections of the Specifications, the Contractor shall perform clean-up operations during construction as herein specified.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

D. Maintain project in accordance with all local, state, and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.
4. Identify potential sources of cleaning water runoff and propose abatement procedures.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, and rubbish.

M. Remove waste materials, debris and rubbish form the site periodically and dispose of at legal disposal dump site.

N. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

O. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.13 FIELD OFFICES

A. The Contractor shall provide and maintain temporary field offices on site for its own use and space shall be provided for the Engineer. The location shall be at the discretion of the Owner.

1.14 SANITARY FACILITIES

A. The Contractor shall provide suitable toilet facilities for its staff, the Engineer and the Owner, and additional facilities for the workmen on the job, including personnel of Subcontractors.

B. Provide chemical toilets where work is in progress and in quantity required by OSHA Code.

C. Chemical toilets and their maintenance shall meet requirements of state and local health regulations and ordinances, and shall be subject to approval of the Engineer and Owner.

1.15 CONSTRUCTION BARRIERS

A. Proper construction barriers shall be provided around the contract work areas as defined by the Contract Drawings or as directed by the Engineer.

B. Construction barriers shall consist of traffic cones, ribbons, tapes, secure fencing, trench covers, wood barriers, warning signs, directional signs, and other traffic materials to keep traffic and people from area of construction and maintain ongoing operations.

C. Barriers shall be erected at such approved locations as are necessary, sufficiently cross-braced and supported adequately from floors and ceilings as required.

1.16 PARKING

A. Only during Contract working hours and to the extent available, existing parking facilities located at the construction area will be available for use by the Contractor, Subcontractors and their employees.

B. The Owner shall not be responsible for cars, trucks, etc. or their contents, and the Contractor, Subcontractors, and material suppliers will use the designated area with this understanding.

1.17 DEBRIS CONTROL AND REMOVAL

A. Debris shall not be permitted to accumulate or migrate and the work shall at all times be kept satisfactorily clean. A dumpster shall be provided by the Contractor for removal of debris for all Subcontractors.

B. Remove debris from the work site on a daily basis and dispose of at any (private or public) approved dump that the Contractor may choose providing that the Contractor shall make all arrangements and obtain all approvals and permits necessary from the Owner or officials in charge of such dumps. Proposed dump site shall be submitted to be approved by the Engineer prior to start of demolition. During disposal process, copies of daily receipts from dumpsite shall be submitted on a regular basis.

1.18 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection, and shall not be left unprotected to the weather or accessible to the public. It is the responsibility of the Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.19 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general

vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the Contractor.

1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.20 SHORING

A. The Subcontractors shall provide all temporary shoring and bracing as required for the proposed work. Comply with all applicable codes and standards.

B. The Contractor is responsible for protecting the existing infrastructure during excavation activities.

C. All shoring and bracing shall be designed by a registered professional engineer in the State of Rhode Island.

D. The Contractor shall ensure that falsework is designed to avoid excessive deflection or overstressing of the sheet piles and/or wale system.

1.21 CONSTRUCTION FENCE

A. A construction fence shall be provided along the entire perimeter of the contract limit lines, and shall be kept in good repair at all times, and shall be arranged to maintain ongoing operation's access and egress.

B. Construction fences shall be six feet high and of chain link, or approved equal, erected in a substantial manner, straight, plumb and true as approved by the Engineer.

C. Gates shall be built into fence at such approved locations as are necessary, well cross-braced, and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to the Owner and Engineer to facilitate emergency access.

D. Fencing shall be removed by the Contractor at no cost to the Owner at such time before final completion as approved by the Engineer. Restore site to acceptable condition after removing fence.

1.22 PROJECT IDENTIFICATION

A. Request sketch of sign language and graphics from the Owner in sufficient time that sign can be fabricated and erected at start of construction.

B. The Contractor shall provide one 3 foot high by 5 foot wide project sign indicating the project title, contract number, and CRMC permit number.

C. Sign shall be lettered by a professional sign painter, in accordance with the general layouts attached. Lettering shall be gloss vinyl, size, and color as indicated as attached at the end of this Section. Surfaces and edges of sign shall receive two coats of exterior primer and two coats of exterior gloss enamel.

D. Submit a shop drawing indicating sign construction and lettering for approval by the Engineer and Owner. The official project title and an electronic file in Autocad drawing format can be provided to the Contractor by the Owner and Engineer upon request.

E. Locate and install the sign at location as specified by the Owner or Engineer. At the completion of the Project, remove the sign and supports completely and restore surface to original condition.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. TEMPORARY FACILITIES shall not be measured separately for payment and shall be included under 01001-1 MOB/DEMOB.

END OF SECTION

SECTION 02100

DEMOLITION AND REMOVAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish all labor, materials, equipment and services necessary for and incidental to the execution and completion of all demolition as shown on the Drawings and as required to complete the project.

B. The work under this Section shall include, but is not limited to, demolition and legal disposal of the existing concrete cap at the landside connection of the existing Coal Pocket Pier; the existing timber pier including timber piles, decking, framing, and fasteners; fender piles located along the stone masonry wall between Coal Pocket Pier and the Coal Pocket Boardwalk; pavement located at Coal Pocket Pier; fender piles at steamship pier including wales and other hardware as needed for pile replacement; demolition required to install sister piles at steam ship pier; the pavement and unsuitable materials located within the excavation behind the sheet pile wall at Leonard's Wharf; and other structures as indicated on the Drawings.

D. All demolition shall be accomplished in a neat, workmanlike manner, and at such time or times as is most suitable to the progress and proper coordination of the project.

E. Conditions as indicated by Contract Drawings are general in nature. The age of varying elements comprising the existing pier and bulkhead have resulted in variations in conditions. The Contractor shall visit and inspect the site to determine the extent and amount of demolition work to be performed before submitting their bid.

1.02 SUBMITTALS

A. Schedule of Work.

B. Verification that disposal site is legal, by certification documentation.

PART 2 PRODUCTS

2.01 TRASH BOOM/SILT CURTAIN DURING DEMOLITION AND CONSTRUCTION

A. A trash boom/silt curtain/turbidity boom shall be deployed around the work area during demolition and construction.

B. The trash boom shall consist of foam flotation units with a permanently attached fabric curtain, weighted at the bottom. The curtain material shall be PVC coated woven polyester, or other approved fabric, with a 200 pound per inch minimum tensile strength. The minimum boom depth shall be 3 feet, including a 6 inch minimum freeboard. The turbidity boom shall extend to the mudline at high tide.

2.02 EROSION AND SEDIMENTATION CONTROL MEASURES

A. Straw Bales

1. Straw bales shall conform to the Massachusetts Department of Transportation Standard Specifications, latest revision, herein referred to as "State Standards".
2. Straw bales shall have a minimum cross section measuring 18" x 24" with a minimum 36" length.
3. Wood stakes shall be oak and conform to the dimensions shown on the plans, and as detailed in the MassDOT Construction Standards, latest revision.

B. Silt Fence

1. Silt fence fabric must be recommended by the manufacturer for use as silt fencing.
2. Silt fence shall be a minimum height of 30" and fastened to posts.
3. Posts shall be constructed of oak and conform to the dimensions shown on the plans.

PART 3 EXECUTION

3.01 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Contractor shall take all necessary precautions to ensure that existing facilities, structures and equipment within and adjacent to the site, and indicated to remain, are not damaged and remain operational during the demolition work.

B. Existing utility systems within and adjacent to the site shall remain in continuous service and shall be protected from damage during construction. Where interruption of a service is required, it shall be scheduled in advance and in coordination with the Engineer or Owner.

C. Contractor shall provide and install trash booms/silt curtain to contain any debris which may fall into the harbor.

D. Contractor shall follow procedures outlined by all local, state and federal agencies having jurisdiction over the work.

E. Work damaged by the Contractor shall be restored to the satisfaction of the at no additional cost to the Owner.

3.02 DISPOSAL OF MATERIAL

A. All material shall become the property of the Contractor except that specified otherwise, and shall be properly and legally disposed of at his own expense, as demolition progresses.

B. Disposal methods shall be in accordance with all federal, state and local requirements; and, acceptable to the Owner and to the Engineer.

3.03 PILE REMOVAL

A. Existing timber piles to be removed shall be pulled in their entirety, and shall be disposed of in a legal manner.

B. Cutting of the existing timber piles at the mudline shall not be permitted.

3.04 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the Drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Erosion and sediment control shall be installed along the base of all material stockpiled on site, and as required to prevent soil-bearing water from entering the Harbor.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. DEMOLITION AND REMOVAL shall be measured as the percentage of demolition complete as measured by the Engineer and shall include the demolition and removal of structures indicated on the Drawings, including but not limited to, the demolition and legal disposal of the existing concrete cap at the landside connection of the existing Coal Pocket Pier; the existing timber pier including timber piles, decking, framing, and fasteners; fender piles located along the stone masonry wall between Coal Pocket Pier and the Coal Pocket Boardwalk; pavement located at Coal Pocket Pier; fender piles at steamship pier including wales and other hardware as needed for pile replacement; demolition required to install sister piles at steam ship pier; the pavement and unsuitable materials located within the excavation behind the sheet pile wall at Leonard’s Wharf; and other structures as indicated on the Drawings.

B. EROSION CONTROL shall be measured as the percentage of site preparation and site restoration complete as measured by the Engineer.

C. Obstructions encountered during pile driving operations that prevent the completion of work are to be removed as specified in Section 02310 TIMBER PILES.

4.02 PAYMENT

A. DEMOLITION AND REMOVAL shall be paid for under Contract Item 02100-1 at the contract lump sum price for demolition complete, which price shall include full compensation for demolition work including all material, equipment, labor, transportation, disposal, and other incidental or appurtenant work required to complete demolition as shown on the Drawings, as specified herein, and as approved by the Engineer. Piles that are broken during removal and not removed in their entirety will not be paid for.

1. Total payment under DEMOLITION AND REMOVAL shall be less than 20 percent of the total contract amount bid.

2. Following mobilization of equipment on site and approval of shop drawings, the Contractor can invoice for 20 percent of this item. Following completion of 40 percent of the work under the Contract, the Contractor may invoice 65 percent (45 percent more) of this item. Following completion of all work under this item, the Contractor can invoice the remaining 35 percent of this item.

B. EROSION CONTROL shall be paid for under Contract Item 02100-2, which price shall include all material, equipment, labor, submittals, and other incidental or appurtenant work required to complete erosion and sedimentation control, site preparation, and site restoration as shown on the Drawings, as specified herein, and as approved by the Engineer.

E. Payment Items

ITEM	DESCRIPTION	UNIT PRICE
02100-1	DEMOLITION AND REMOVAL	LUMP SUM
02100-2	EROSION CONTROL	LUMP SUM

END OF SECTION

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall provide all labor, equipment, materials, tools and accessories to complete the work in this section. This work includes, but is not necessarily limited to:

1. Excavation and disposal
2. Structural filling and backfilling
3. Site filling and backfilling
4. Fill materials
5. Compaction requirements
6. Sinkhole Remediation by Backfilling
7. Geotextile fabric

1.02 SUBMITTALS

A. Submit 40 lb. sample of each type of fill to the Engineer, in air-tight containers, to establish reference densities.

B. Submit shop drawings or product data for all materials and equipment required under this Section.

1.03 REFERENCES

A. Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges (latest edition) - Division II, Section 100, 200, 300 and 400, Division III.

B. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

C. ANSI/ASTM D1556 - Density of Soil in Place by the Sand Cone Method.

D. ANSI/ASTM D1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10 lb. (4.54 kg) Rammer and 18 inch (457 mm) Drop.

1.04 UTILITIES AND PROTECTION

A. The Contractor shall locate and mark active underground utility lines before commencing work. Utility services to remain shall be protected from damage and shall be plotted on the Record Plans by the Contractor. Utilities which are not

active shall be protected or properly removed as directed by the Engineer and the Owner. Existing utilities shall not be interrupted except when authorized in writing both by the Engineer and by authorities having jurisdiction.

B. The location and size of the existing sewers, drains, culverts, water mains, gas mains, cables, service pipes, and other utilities shown on the Contract Drawings, were obtained from the results of surveys and existing records and are shown as approximate only, to guide the Contractor in the preparation of his bid. The drawings do not show the exact location and depth of all utilities, nor do they show all utilities or the number of lines for each utility that may encountered.

C. All utilities interfered with or damaged shall be properly restored immediately, by the Contractor. The Contractor shall carefully bed, tamp and fully consolidate refill material around and under all existing utilities encountered or crossed unless otherwise shown on the Contract Drawings.

D. Excavated areas shall be kept free from water, snow and ice during construction. Pumping operations shall be performed should surface rain, groundwater or tide be encountered during construction. Sheeting, shoring and trench boxes shall be of proper strength and shall be placed where necessary to prevent caving, erosion or gullying of excavation sites.

E. The Contractor shall ensure that no excavation is left open, unguarded, or water filled during any period of time when work is not actually in progress. It is the purpose and intent that all excavations and backfill, including consolidation operations, and temporary surfacing within an area be accomplished expeditiously before proceeding to other work areas.

1.05 SHORING, SHEETING, BRACING, AND SLOPING

A. The Contractor shall furnish, install, and maintain shoring, sheeting, bracing, and sloping necessary to support the sides of excavations, maintain a stable excavation bottom, and to keep and to prevent any movement which may damage adjacent pavements, utilities, or structures, damage or delay the work, or endanger life and health. Furnish, install, and maintain shoring, sheeting, bracing, and sloping as required by OSHA and other applicable governmental regulations and agencies.

1.06 EXCAVATION SAFETY

A. The Contractor shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to attain a stable base, retain excavation sideslopes and prevent earth slides to ensure that persons working in or near the excavation are protected.

1.07 CODES, ORDINANCES, AND STATUS

A. The Contractor shall familiarize itself with, and comply with, all applicable codes, ordinances, statues, and bear sole responsibility for the penalties imposed for noncompliance.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Gravel backfill shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation requirements shall conform to the following:

(Mass. DOT Spec M1.03.0, Type C)

U.S. Sieve No.	Percent Passing by Weight
1/2"	50-85
#4	40-75
#50	8-28
#200	0-10

Maximum size of stone shall be two inches (2") largest dimension.

B. Crushed stone where shown on the plans shall consist of inert material that is hard, durable stone, free from loam, clay, surface coatings, and other deleterious materials. Gradation requirements shall conform to the following:

U.S. Sieve No.	Percent Passing by Weight
4"	100
2"	90-100
1"	10
#4	2

Maximum size of stone shall be three inches (3") largest dimension.

C. Granular backfill shall be well graded, natural inorganic soil, approved by the Engineer and meeting the following requirements:

1. It shall be free of organic or other weak or compressible materials, of frozen materials, and of stones larger than six inches (6") maximum dimension.
2. It shall be of such nature and character that it can be compacted to the specified densities in a reasonable length of time.
3. It shall be free from highly plastic clays, from all materials subject to

decay, decomposition, or dissolution and from cinders or other materials which will corrode piping or other metal.

4. It shall have a maximum dry density of not less than 100 lbs. per cubic foot.
5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements and is approved by the Engineer.
6. This material shall have the physical characteristics of soils designated as group A-1 or A-3, under AASHTO M145. It shall have properties such that it may be readily spread and compacted.

2.02 GEOTEXTILE FABRIC

A. Geotextile fabric shall be non-woven Mirafi 500x or approved equal.

B. Overlap fabric at least 24 inches.

PART 3 EXECUTION

3.01 EXCAVATION

A. The Contractor shall excavate the existing soils or fill to the dimensions and elevations shown on the Contract Drawings, or as necessary to install the various components of the work.

B. The Contractor shall separate excavated materials as suitable and unsuitable for backfill, as approved by the Engineer. It is understood that the majority of existing fill will be re-used as backfill, with minimal imported fill required. Unsuitable material shall be immediately removed from the site. All material removed from the site shall be disposed of legally. Suitable material taken from excavations shall be stockpiled for future backfilling within the staging areas as indicated on the Drawings or as directed by the Engineer.

C. The Contractor shall maintain project benchmarks for horizontal and vertical control of excavations and backfilling.

D. Suitable material for backfilling shall meet the requirements of the fill materials specified in these Contract Documents. Soils with significant fines content, organic material, miscellaneous fill or other objectionable material will not be allowed as backfill.

E. Excavation for footings shall be made to the design elevation leaving a bottom of undisturbed earth, smooth, and free of loose materials.

F. Excavated material shall not be deposited or piled so as to cause excessive settlement or endanger portions of any new or existing structures, such as

surcharge loading of bulkheads or walls.

G. Unsuitable soil or materials found during excavation shall be removed, as determined in the field by the Engineer. The Engineer shall be present during excavation of unsuitable soil or materials to verify the volume of material removed. Grades will be restored with approved fill as directed by the Engineer.

H. The Contractor shall take appropriate measures to shore the walls of the excavation when necessary, particularly when made below water level. Excavations shall be in accordance with current OSHA standards.

3.02 INSPECTION

A. The Contractor shall verify that stockpiled fill to be reused has been approved by the Engineer.

B. Before backfilling, the Contractor shall verify that drainage and utility installation has been inspected.

C. Prior to backfilling, the Contractor shall verify that areas to be backfilled are free of debris, snow, ice, or water, and that ground surfaces are not frozen.

3.03 PREPARATION

A. When necessary, compact subgrade surfaces to density requirements for fill or backfill material.

B. Cut out soft areas not readily capable of in situ compaction. Backfill with structural fill and compact to density equal to requirements for subsequent backfill material.

3.04 FILLING AND BACKFILLING

A. Fill or backfill areas to the contours and elevations as shown on the Contract Drawings. Use unfrozen materials.

B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.

C. Compact all materials by mechanical means. Employ a placement method so not to disturb or damage drainage pipes, utilities in trenches or existing sheet pile walls.

D. Maximum thickness of loose lift to be twelve (12) inches unless approved by the Engineer.

E. Maintain optimum moisture content (+/- 2%) of backfill materials to attain required compaction density.

F. Backfill against foundation walls of other structures simultaneously on each side to limit lateral loading. Hand operated equipment shall be required next to bulkhead wall and footings.

G. Make changes in grade gradual. Blend slopes into level areas.

H. Place surplus backfill materials as directed by the Engineer. Leave stockpile areas completely free of excess fill materials.

I. Do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

J. Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and recompact as specified for fill and compaction below, at no additional cost to the Owner.

3.05 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one (1) inch.

3.06 FIELD QUALITY CONTROL

A. Compaction testing shall be performed in accordance with ANSI/ASTM D1557 and ANSI/ASTM D1556.

B. Structural fill shall be compacted to 95% (minimum) of the Modified Proctor Test, ASTM D1557.

3.07 CLEANUP

A. At the end of all filling and grading operations and before acceptance of the work, the Contractor shall remove all debris, materials, rubbish, etc., from the site, disposing of them in a manner satisfactory to the Engineer. The premises shall be maintained clean, presentable and satisfactory.

3.08 WORK IN FREEZING WEATHER

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit.

B. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operation. Prior to terminating operations for the day, the final

layer of fill, after compaction, shall be rolled with a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.

C. The Contractor shall not place a layer of compacted fill on snow, ice or soil that was permitted to freeze prior to compaction. Removal of these unsatisfactory materials will be required as directed by the Owner.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. No separate measurement or payment shall be made for excavation, stockpiling, placement, and compaction of existing on-site material used for filling and backfilling. Include costs under items for which excavation, backfill and compaction are required.

B. No separate measurement or payment shall be made for dense graded material, crushed stone used for the preparation of the pavement base. Include costs for pavement base preparation under ITEM 02513-1 BITUMINOUS PAVING.

C. Measurement for off-site borrow material required to supplement existing fill material, if required, shall be by the cubic yard installed complete.

D. Contractor shall utilize approved existing excavated material for filling and backfill. Contractor shall coordinate ordering and delivery of borrow material with the Engineer. Borrow material delivery and measurement for payment shall not be made for material utilized for the Contractor's convenience or not approved by the Engineer.

4.02 PAYMENT

A. Payment for borrow material shall be per cubic yard measured in place, complete, which price shall include full compensation for furnishing gravel, crushed stone or dense graded borrow material, excavation, base preparation, compaction, and grading, as shown by the drawings, as specified herein, and as directed by the Engineer.

4.03 PAYMENT ITEMS

ITEM	DESCRIPTION	UNIT PRICE
02220-1	IMPORTED BORROW	CUBIC YARD

END OF SECTION

SECTION 02310

TIMBER PILES

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall provide all labor, equipment, materials, tools and accessories to complete the work in this section. This work includes, but is not necessarily limited to:

1. Removal, supply, and installation of timber piles to the lines and elevations as shown on the Contract Drawings for the work of the pier replacement.

1.02 SUBMITTALS

A. The Contractor shall submit six (6) copies of the manufacturer's cut sheets for timber piles indicating material type, for Engineer approval, prior to the purchase and placement of this material.

B. The Contractor shall provide manufacturer information on equipment to be utilized for the work indicated within this Section, as further described in Section 01000 GENERAL INSTRUCTIONS.

C. For all timber piles the Contractor shall submit six (6) copies of the manufacturer's Certificate of Compliance indicating that the materials shipped to the site comply with the requirements of the materials specified in this contract.

D. The Contractor shall submit a pile log with tip elevations and cutoff lengths for each pile.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. American Wood Preservers Association (AWPA)

PART 2 PRODUCTS

2.01 GENERAL

A. New timber piles shall be Southern Yellow Pine or Douglas Fir and conform to the following:

1. Treatment: CCA minimum retention of 2.5 pcf in accordance with AWPA Standard C18 unless indicated otherwise.

2. Minimum diameter:

   a. 12-inch Diameter Pile: 12-inches at 3-feet from butt and 8 inches at the tip.
   b. 16-inch Diameter Pile: 16-inches at 3-feet from butt and 11.5 inches at the tip.

3. Sealing compound for cut-offs: 2 liberal brush coats of Copper Naphthenate containing a minimum of 2% metallic copper in solution, meeting AWPA Standards M4 and P8.

4. ASTM Standard D25 "Standard Specifications for Round Timber Piles", latest edition, Class B.

B. Pile Toe Protection:

1. Pile shoes shall be installed prior to pile driving.

2. Pile shoes shall be cast alloy steel cutting shoe, designed to fit integrally to the piles. Shoe design and manufacturer shall be subject to the approval of the Engineer.

C. Hardware:

1. Nuts, Bolts, and Washers ASTM A-307 Grade A.

2. All hardware shall be hot dip galvanized in accordance with ASTM A-153. Minimum coverage shall provide 2.0 oz. zinc per square foot.

3. All bolts, washers, nuts, shackles, and chains specified in this Section will be of the size shown on the Drawings, or as approved by the Engineer.

PART 3 EXECUTION

3.01 NEW TIMBER PILES

A. Install new timber piles as shown on Contract Drawings.

B. Piles shall be driven to refusal or to the tip elevation shown on the Drawings, as approved by the Engineer. Jetting of piles shall not be permitted.

C. Contractor shall be responsible for correctly locating new piles to be installed. Piles

shall be installed within 2-inches of the design location. Piles not driven within these limits will not be eligible for payment. Piles may not be pulled into position.

D. Piles shall be cut a minimum of 3-feet from the top after installation and at the elevation indicated on the Drawings. Top of piles shall be brush coated with two coats of preservative.

E. Piles shall be installed using an impact hammer of sufficient capacity to achieve tip elevations as shown on the Drawings. Use of vibratory hammers will not be permitted.

F. It is anticipated that existing jetty and armor stones may be displaced in the area of proposed work. Stones encountered along the footprint of the proposed pier which prevent the completion of work as shown on the Drawings shall be relocated to the extents required for safe completion of the specified work as approved by the Engineer.

1. Contractor shall relocate stones or other obstructions prior to advancing piles. Contractor shall provide measures including pile spudding and excavations up to 5-foot depths to eliminate obstructions.

G. Contractor shall submit a pile log with tip elevations and cutoff lengths for each pile.

H. Timber piles, with the tops exposed to rain, shall be provided with UV resistant polyethylene white pile caps as manufactured by Dock Boxes Unlimited or approved equivalent.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. 12-INCH TIMBER PILES shall be measured at the Contract unit price per linear foot of timber pile installed complete as specified and as shown on the Drawings, as measured by the Engineer.

B. 16-INCH TIMBER PILES shall be measured at the Contract unit price per linear foot of timber pile installed complete as specified and as shown on the Drawings, as measured by the Engineer.

C. Demolition, removal, and disposal of existing timber piles shall be included under Contract Item 02100-1 DEMOLITION AND REMOVAL.

4.02 PAYMENT

A. 12-INCH TIMBER PILES installed for the fixed timber pier shall be paid for under

Contract Item 02310-1, which price shall include full compensation for the furnishing and installation of timber pier support and batter piles; fasteners; preparation including excavation and spudding to advance piles; pile shoes; all labor, materials, tools, and equipment; and all other incidental work necessary to complete the work under this item as shown on the Drawings and as specified herein.

B. 16-INCH TIMBER PILES installed for the fixed timber pier shall be paid for under Contract Item 02310-2, which price shall include full compensation for the furnishing and installation of timber pier support and batter piles; fasteners; preparation including excavation and spudding to advance piles; pile shoes; all labor, materials, tools, and equipment; and all other incidental work necessary to complete the work under this item as shown on the Drawings and as specified herein.

C. Pile cutoffs shall not be measured for payment.

D. No separate measurement shall be made herein for excavation, pile spudding, stockpiling, or relocation of obstructions.

E. Payment Items

ITEM	DESCRIPTION	UNIT PRICE
02310-1	12-INCH TIMBER PILES	LINEAR FOOT
02310-2	16-INCH TIMBER PILES	LINEAR FOOT

END OF SECTION

SECTION 02513

BITUMINOUS PAVING

PART 1 GENERAL

1.01 WORK DESCRIBED

A. Placement of new bituminous pavement base course and top course or wearing course to the thickness and to the lines and grades shown on the Drawings, including pavement base, as specified herein, and as approved by the Engineer.

1.02 SUBMITTALS

A. Submit proposed mix design of each class of mix for review prior to commencement of paving operations.

B. Material Certificates: Provide copies of material certificates signed by material producer and/or subcontractor certifying that each material item complies with or exceeds specified requirements.

1.03 REFERENCES

A. The following standards shall apply to the work of this Section.

1. American Association of State Highway and Transportation Officials (AASHTO):

M 20	Penetration Graded Asphalt Cement
M 82	Cut-Back Asphalt (Medium Curing Type)
M 140	Emulsified Asphalt

2. American Society of Testing Materials:

D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-pounds Rammer and 18-in. drop.

3. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specification for Highway and Bridges

4. Federal Specifications (Fed. Spec.):

SS-S-1401	Sealing Compound, Hot Applied, for Concrete and Asphalt Pavements

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall conform to the requirements of the Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, formally the Massachusetts Department of Public Works (MDPW), latest edition.

B. Crushed stone (if required) shall be in conformance with MHD Section M2.01.7.

2.02 BITUMINOUS CONCRETE PAVEMENT

A. The binder (base) and wearing (top) courses for Class I, Type I-1, bituminous concrete pavement shall conform to the requirements of Subsection MHD Standard Specifications.

2.03 JOB-MIX FORMULA

A. The general composition limits of materials shall conform to columns entitled "Binder Course" and "Top Course" as listed in Subsection 3.11.03 of the MHD Standard Specifications. No bituminous concrete pavement shall be placed until the Engineer approves the job mix formula.

B. Top course shall be comprised of aggregate with color similar to existing adjacent pavement, approved by the Engineer, prior to installation.

PART 3 EXECUTION

3.01 PAVING PREPARATIONS

A. To receive payment, all surfaces shall be examined by the Engineer to see that they are in proper condition to receive the work specified. The Engineer shall review and mark all deteriorated areas to be removed in the field with the Contractor prior to saw-cutting of existing pavement.

B. The edge of all damaged pavements or deteriorated pavements within the project limits shall be cut back a sufficient distance to form a clean, sharp, straight edge. Cut back pavement shall be carefully removed to minimize any disturbance to foundation materials. The exposed surface of the foundation material shall then be compacted, wetting the surface as necessary to obtain a firm, even surface. Any depressions or uneven areas shall be regraded and recompacted until the surface is smooth and satisfactorily compacted.

C. Areas where erosion has resulted in lowering or damage of the base course shall be filled by the Contractor utilizing compacted granular backfill or crushed stone as approved by the Engineer. Sub-base shall be maintained in satisfactory condition and properly drained until final pavement is placed.

3.02 PERMANENT SURFACING

A. Permanent bituminous concrete surfacing shall be laid consisting of a 1-1/2 inch minimum top or finished course. Each course shall be thoroughly rolled and compacted to form a smooth dense surface. The finished surface elevation of the top course shall match those adjoining undisturbed existing paved surfaces.

B. New bituminous concrete pavement and existing bituminous concrete pavement shall meet with a stacked joint at the sawcut. After sawcutting, a depth equal to the top course of the new pavement shall be removed along a 12 inch width of the existing pavement as measured from the sawcut. The new top course pavement shall extend across the sawcut line to meet the existing pavement surface.

C. The edges of abutting bituminous concrete surfacing shall be painted with a bituminous coating to assure a satisfactory, watertight bond between the existing and new pavements.

D. Construction requirements for placement of bituminous concrete surfacing shall conform to the applicable requirements of Section 460 of the MHD Standard Specifications, and as herein specified. A tack coat shall be applied to all existing bituminous surfaces.

3.03 BITUMINOUS CONCRETE PAVEMENT

A. Construction requirements for bituminous concrete pavement shall conform to Section 460.60 of the MHD Standard Specifications.

B. Material for proposed bituminous concrete roadway shall be spread on the existing surface or sub-base in two courses in the compacted thickness indicated.

3.04 QUALITY ASSURANCE

A. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. BITUMINOUS PAVING shall be measured per square yard complete, as measured by the Engineer. Sawcutting and removal of existing pavement shall be included under Section 02110 – Demolition and Removal.

B. BITUMINOUS PAVING associated with BID ALTERNATE NO.2 – LEONARDS'S WHARF PAVEMENT REPLACEMENT shall be measured per square yard complete as measured by the Engineer. Sawcutting and removal of existing pavement shall be included under Item 02513-2 BID ALTERNATE NO.2 – LEONARDS'S WHARF PAVEMENT REPLACEMENT.

4.02 PAYMENT

A. Payment for Item 02513-1 BITUMINOUS PAVING shall be paid per square yard pavement installed complete, which price shall include full compensation for excavation, grading, survey, pavement base, binder course, finish course, striping, raising existing structures to grade, and all other material, equipment, labor, and incidental or appurtenant work required, as shown on the Drawings, as specified herein, and as directed by the Engineer.

B. Payment for Item 02513-2 BID ALTERNATE NO.2 – LEONDARD'S WHATF PAVEMENT REPLACEMENT shall be paid per square yard pavement installed complete, which price shall include full compensation for excavation, grading, survey, pavement base, binder course, finish course, striping, raising existing structures to grade, and all other material, equipment, labor, and incidental or appurtenant work required, as shown on the Drawings, as specified herein, and as directed by the Engineer.

C. Payment Item

ITEM	DESCRIPTION	UNIT COST
02513-1	BITUMINOUS PAVING	SQUARE YARD
02513-2	BID ALTERNATE NO. 2 - LEONARD'S WHARF PAVEMENT REPLACEMENT	SQUARE YARD

END OF SECTION

SECTION 03300

MARINE CONCRETE

PART 1 GENERAL

1.01 WORK DESCRIBED

A. Placement of new cast-in-place concrete as shown on the Drawings, including reinforcement, concrete materials, mixture design, placement procedures, and finishes, as specified herein, and as approved by the Engineer.

1.02 SUBMITTALS

A. Submit proposed mix design to the Engineer for review prior to commencement of work.

B. Submit product data and manufacturers' instructions to Engineer for approval.

C. Submit shop drawings of reinforcing steel to Engineer for approval. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, and supporting and spacing devices.

D. Material Certificates: Provide copies of material certificates signed by material producer and/or subcontractor certifying that each material item complies with or exceeds specified requirements.

1.03 REFERENCES

A. The following standards (latest edition) shall apply to the work of this Section.

1. American Concrete Institute (ACI):

SP-15	Field Reference Manual
SP-66	ACI Detailing Manual
211	Large-Scale Structural Testing
301	Specification for Structural Concrete
304	Guide for Measuring, Mixing, Transporting, and Placing Concrete
305	Guide to Hot Weather Concreting
306	Guide to Cold Weather Concreting
309	Guide for Consolidation of Concrete
311	Specification for Ready Mixed Concrete Testing
318	Building Code Requirements for Structural Concrete

2. American Society of Testing Materials (ASTM):

A185	Standard Specification for Welded Steel Wire Fabric For Concrete Reinforcement
A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
A706	Standard Specification for Low-Allow Steel Deformed and Plain Bars for Concrete Reinforcement
C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C33	Standard Specification for Concrete Aggregates
C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C94	Standard Specification for Ready-Mixed Concrete
C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
C150	Standard Specification for Portland Cement
C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C260	Standard Specification for Air-Entraining Admixtures for Concrete
C494	Standard Specification for Chemical Admixtures for Concrete
C989	Standard Specification for Slab Cement for Use in Concrete and Mortars

3. American Welding Society (AWS)

D1.4	Structural Welding Code – Reinforcing Steel

1.04 QUALITY ASSURANCE

A. All work performed shall be in accordance with ACI 301 and ACI 318 quality assurance requirements.

B. Concrete, aggregate, admixtures and other materials shall be obtained from the same source throughout the Work.

1.05 REGULATORY REQUIREMENTS

A. All work performed shall conform to the Massachusetts Building Code (MBC) and ACI 318.

B. Contractor shall maintain ACI 301 and ACI 318 references on site.

1.06 TESTS

A. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein under provisions of the General Conditions.

B. Submit proposed mix design to the Engineer for review prior to commencement of work.

C. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein. Costs of testing shall be paid for by the Contractor.

D. Testing firm will perform slump tests in accordance with ASTM C143.

E. Testing firm shall make and cure concrete test cylinders in accordance with ASTM C31 and perform laboratory compressive strength tests in accordance with ASTM C39.

F. One set of concrete test cylinders will be taken for every concrete pour.

G. One slump test will be taken.

H. Air entrainment tests shall be performed in accordance with ASTM C231 or ASTM C173.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cementitious Material.

1. Portland Cement ASTM C150 Type II C.
2. Ground Granulated Blast-Furnace Slag ASTM C989, Grade 120.

B. Aggregates.

1. Provide from one source of supply to ensure uniformity in color, size, and shape unless otherwise accepted by the Engineer Ground Granulated Blast-Furnace Slag ASTM C989, Grade 120.
2. Do not use aggregates containing soluble salts or other substances such as iron sulphides, pyrite, marcasite or ochre which can cause stains on exposed concrete surfaces.
3. Fine Aggregate:
    a. Optional grading in ASTM C33 shall apply.
    b. Restriction on reactive material in ASTM C33 shall apply.
    c. Use clean, sharp, natural sand. Do not use dune sand, or manufactured sand from a crushing operation.

4. Coarse Aggregate:
    a. Use size number 67 for mixtures having a maximum coarse aggregate size of ¾-inch.
    b. Class designation is 3S per ASTM C33.
    c. Use crushed stone processed from natural rock or stone, or washed gravel-either natural or crushed. Do not use pit or bank run gravel.
    d. Maximum aggregate size shall be ¾-inch.

C. Water.

1. Water shall be clean and potable free of impurities detrimental to concrete workability and serviceability.

2.02 ADMIXTURES

A. Provide all admixtures used in the concrete mix from the same manufacturer.

B. Admixture Performance: Provides dense, durable concrete resistant to chemical attack, wear, rebar corrosion, freeze-thaw attack, cracking, and segregation. All admixtures used shall be compatible. All admixtures shall be free of chlorides or other corrosive chemicals.

C. Air Entrainment shall conform to ASTM C260.

D. Water reducing agent: "Sonotard WR" by Sonneborn Building Products, "WRDA" by W.R. Grace & Company, "Pozzolith 100" by Master Builders Co. or equal as approved by the Engineer and conforming with ASTM C 494 Type A.

E. Air-entraining agent: "Aerolith" by Sonneborn Building Products, "Darex" by W.R. Grace & Company, "MB-VR" by Master Builders Company or equal approved by the Engineer conforming to ASTM C 260. To be used to obtain percent air-entrainment specified unless obtained by cement used.

F. High Early Agent: "Pozzolith 122-HE" by Master Builders or equal as approved by the Engineer and conforming with ASTM C 494 Type C and E.

G. No other admixtures may be used without Engineer approval.

H. Superplasticizers:

1. Meet ASTM C494 and use only Type F or G.
2. Hold slump of 5 inches or greater for the time required for placement into the structure.
3. Type F Superplasticizer: Batch plant added to extend plasticity time, control temperature of fresh concrete, reduce water 20 to 30 percent, and give higher

strengths at all ages.

4. Type G Superplasticizer: Batch plant added to extend plasticity time, maintain setting characteristics similar to normal concrete throughout its recommended dosage range and at varying concrete temperatures, reduce water 30 to 40 percent, and give high-early and ultimate strengths.
5. Manufacturer and Product:
    a. Master Builders, Inc., Cleveland, OH, Rheobuild or Pozzolith Polyheed at a dosage greater than 10 ounces per 100 pounds of cement.
    b. W.R. Grace & Co., Cambridge, MA, Daracem 100.
    c. Euclid Chemical Co., Cleveland, OH, Eucon Super F or 537G.

2.03 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete of the following characteristics:

1.	Compressive Strength (7 days)	3,000 psi
2.	Compressive Strength (28 days)	4,000 psi
3.	Aggregate size (maximum)	3/4-inch
4.	Aggregate Size (minimum)	25% passing #50 sieve
5.	Air Entrainment	5% to 7%
6.	Maximum Water to Cement Ratio (W/C)	0.45
7.	Minimum Cementitious Material Content	540 lbs./cu.yd

C. Ground granulated blast-furnace slag shall make up 50% of the cementitious material by weight.

D. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

E. Add air entraining agent to concrete mix.

F. Use water-reducing admixtures in strict compliance with the manufacturer's directions. Admixtures to increase cement dispersion, or to provide increased workability for low-slump concrete, may be used at the Contractor's option subject to the Engineer's acceptance.

G. If a pumping process is utilized to convey concrete, established concrete mixtures may require increased proportion of cement and fine aggregate and a decreased proportion of coarse aggregate, but these mixtures may not be altered more than:

1.	Cement	plus 20 lbs./cu.yd
2.	Fine Aggregate	plus 50 lbs./cu.yd
3.	Aggregate size (maximum)	minus 50 lbs./cu.yd

2.04 CONCRETE REINFORCEMENT

A. Reinforcing steel shall conform to ASTM Specification A 615, Grade 60. Welded wire fabric shall conform to ASTM A185, Grade 65. All reinforcing steel shall be epoxy coated.

B. If the number of bars is shown on drawings, the number given shall govern over the spacing.

C. Splicing of bars and details not covered herein shall be in accordance with the recommendations of "Manual of Standard Practice for Detailing Reinforced Concrete Structures ACI 315."

D. Obtain Engineer's approval of all splices not shown on the project drawings.

E. Tie wire shall be 16-1/2 gauge or heavier zinc or plastic coated wire.

2.05 FORMWORK

A. Bar supports shall be Class 1 plastic coated wire bar supports or plastic bar supports.

B. Formwork shall be sufficiently strong and stiff to prevent deflection during concrete placement.

C. Structurally design forms to meet applicable safety regulations, OSHA regulations, and other codes.

D. Finished concrete tolerances shall be minus 1/4 inch and plus 1/2 inch from the dimensions shown.

E. All concrete edges shall have a formed 1- inch chamfer, unless otherwise indicated.

F. Forms shall be left in place a minimum of 3 days after concrete placement.

G. Form ties shall have conical or spherical type inserts such that no metal is left within 1 inch of the concrete surface when tie ends are removed. Patch form tie holes with non-shrink grout.

H. Form ties shall not be in contact with galvanized reinforcing steel. Maintain a minimum 1/2 inch clearance between reinforcing steel and form ties.

I. Construction joints shall be formed with a keyway sufficient to transfer concrete shear capacity. Forming detail shall be subject to approval by the Engineer prior to placing any concrete.

2.06 FALSWORK

A. All falsework shall be designed by a registered professional engineer in the State of Massachusetts.

B. The Contractor shall ensure that falsework is designed to avoid excessive deflection or overstressing of the sheet piles and/or wale system.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

B. Strength: Strength of concrete shall be considered satisfactory if the average of any five consecutive strength tests of the laboratory cured specimens representing each strength of concrete is equal to or greater than the specified strength and if no more than 20 percent of the strength tests have values less than specified.

C. Additional Tests:
1. If concrete shown by laboratory strength tests is defective, the Contractor may, at his own expense, conduct such testing as he may deem necessary. Test results so obtained, unless properly calibrated and correlated with other test data, shall not be used as a basis for acceptance or rejection.
2. If cores are taken for such determination they shall be in accordance with ASTM C 42. Testing shall be by an independent laboratory approved by the Engineer.
3. At least three cores shall be taken from each potentially deficient area. Locations will be determined by the Engineer. Damaged cores may be replaced.
4. Strength of cores from each member or area shall be considered satisfactory if their average is equal to or greater than 90% of the specified strength.
5. Core holes shall be plugged solid with grout approved by the Engineer.

3.02 PREPARATION

A. Prepare previously placed concrete by cleaning and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.

B. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout

C. Backfilling shall be performed in accordance with Section 02200 EXCAVATION BACKFILL AND COMPACTION.

3.03 PLACING CONCRETE

A. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

B. Do not place concrete until soil bottoms, inserts, embedment's, and other work to be built into the concrete have been inspected and approved by the Engineer and by all trades concerned.

C. Convey concrete from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.

D. Deposit, deliver and place concrete so that the time lapse between batching and placement shall not exceed 60 minutes. Concrete shall not be allowed a free fall of over 4 feet. Concrete placed in water shall be by Tremie method, using a pump truck and hose of sufficient length to reach the bottom of the concrete. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing.

E. Place concrete in accordance with ACI 301.

F. Hot Weather Placement: ACI 301.

G. Cold Weather Placement: ACI 301.

H. Ensure reinforcement, inserts, embedded parts, formed joints and expansion joints are not disturbed during concrete placement.

3.04 FINISHES AND EXPOSED SURFACES

A. All concrete shall be screeded to the established elevations, then steel troweled to the finish lines on the drawings with allowable tolerance not exceeding 1/8 inch in any direction when treated with a 10-foot long straightedge.

B. Honeycombing on any exposed surface shall be patched with non-shrink grout to the approval of the Engineer.

C. If the above requirements are not met, the Contractor shall, at his own expense, correct the conditions, as directed by the Engineer, using materials and methods approved by the Engineer.

3.05 PATCHING

A. Patch imperfections as directed by the Engineer.

3.06 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.07 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with this specification.

3.08 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Water: Clear and free of impurities.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. CONCRETE HEADWALL shall be measured per cubic yard installed in place to the lines and elevations shown on the Drawings, as measured by the Engineer, and as specified herein.

4.02 PAYMENT

A. CONCRETE HEADWALL shall be paid for under Contract Item 03300-1, which price shall include the furnishing of all labor, materials, equipment, and tools; preparation; excavation, backfill, and compaction; drainage extensions through the concrete headwall and crushed stone; cleaning; concrete forming; reinforcement; concrete bonding agent; concrete placement; curing; jointing; and all other incidental work necessary to complete the work under this item as shown on the Drawings, as specified herein, and as approved by the Engineer.

D. Payment Items

ITEM	DESCRIPTION	UNIT COST
03300-1	CONCRETE HEADWALL	CUBIC YARD

END OF SECTION

SECTION 03310
CONCRETE PILE ENCAPSULATION

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish all labor, materials, equipment and services necessary for and incidental to the execution and completion of all Concrete Pile Encapsulations as indicated on the Drawings and as required to complete the project.

B. Conditions as indicated by Contract Drawings are general in nature. The age and subsequent repair and reconstruction of varying elements comprising the pier have resulted in variations in conditions. The Contractor shall visit and inspect the site to understand existing conditions and to determine the extent and amount of cleaning of marine growth, removal of deteriorated concrete, and other necessary work to be performed before submitting their bid.

1.02 REFRENCES

The latest edition of the following:

A. ASTM Standards: D638; D796; D790; D2583; D256; D570; D150; 6153;

1.03 SUBMITTALS

A. Submit concrete form systems for review and approval by the Engineer.

B. Contractor shall prepare and submit dive plan and underwater work health and safety plan for review and approval.

PART 2 PRODUCTS

2.01 FIBERGLASS JACKET FORM

A. The fiberglass form thickness shall be a minimum of 3/16 inches, designed to resist forces and stresses it may encounter during handling and injection of concrete, in accordance with Contractor placement procedures and wet concrete heights.

B. The form shall be translucent to provide visual inspection during the pumping of the grout.

C. The fiberglass form shall have the following minimum properties:

a.	Ultimate Tensile Strength (ASTM D638)	16,000 psi
b.	Ultimate Flexural Strength (ASTM D796)	20,000 psi
c.	Flexural Modulus of Elasticity (ASTM D790)	800,000 psi
d.	Barcol Hardness (ASTM D2583)	30 min
e.	IZOD Impact – notched (ASTM D256)	20 ft-lbf/inch
f.	Water Absorption (ASTM D570)	<1%
g.	Relative Permitivity @ 60 Hz (ASTM D150)	4.40
h.	Ultra-Violet (UV) Accelerated	

i.	Weathering (ASTM 6153)	Pass
j.	Test 500 hours	
k.	Twin Carbon ARC	
l.	Standard Color	Translucent
m.	Wall Thickness	3/16 inch

D. The fiberglass form shall have a tongue and groove closure, and will have supplemental banding to adequately support the forms.

E. Existing pile interferences are such that forms will conflict with one another. Provide specialty forms such as "pair-of-pants" to accommodate such conflicts as approved by the Engineer. Accommodate existing bracing as required. Submit shop drawings for specialty forms.

F. Concrete and reinforcing shall be in accordance with Section 03300 – MARINE CONCRETE.

PART 3 EXECUTION

3.01 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Contractor shall take all necessary precautions to ensure that existing facilities, structures and equipment within and adjacent to the site, and indicated to remain, are not damaged and remain operational during the demolition work.

B. Existing utility systems within and adjacent to the site shall remain in continuous service and shall be protected from damage during construction.

C. Contractor shall provide and install trash booms/silt curtain to contain any debris which may fall into the River.

D. Contractor shall follow procedures outlined by all local, state and federal agencies having jurisdiction over the work.

E. Work damaged by the Contractor shall be restored at his own expense to the satisfaction of the Owner's Representative.

3.02 CLEANING AND SURFACE PREPARATION

A. Identify and verify piles to be protected with the concrete encapsulations between elevations indicated in the Drawings.

B. Provide underwater video inspection, in the presence of the Engineer, of all existing piles to be encapsulated. Video inspection of all piles will also be completed following cleaning and installation of reinforcement. A total of two (2) video inspections will be completed.

C. Prior to application, thoroughly clean and remove marine growth, oil, grease, rust and any other deleterious material which might prevent proper bonding between the pile and new encapsulation. Surfaces shall be cleaned by waterblasting, mechanical scraping, or other acceptable methods.

3.03 PREPARATION OF FIBERGLASS FORM

A. Stand-offs shall be placed around the circumference of the rebar cage to provide a space between the rebar and Fiber-Form. Typical material used is 3" PVC pipe cut into 6 inch lengths and wired to the rebar cage.

B. Excavate the mud approximately 2 feet at the base of the pile and install the Fiber-Form. Seal the base of the Fiber-Form in preparation for concrete.

C. The inside surface of the Fiber-Form shall be clean and free of grease and dirt. The Fiber-Form shall be opened and position around the pile.

D. The form shall be secured by temporary nylon straps, steel straps or other means to assure that it will not move or distort during placement of grout. Spacing is recommended at minimum 18 inches or as required.

E. All vertical seams shall be fastened with 1-1/2" hex head self-taping screws or 3/16 inch diameter rivets that shall not exceed 6 inch spacing.

F. Port holes shall be drilled and installed at proper locations as determined by the Contractor and approved by the Engineer. A threaded port hole secured by bolts or riveted internal flap shall be installed at required locations.

3.04 CONCRETE PLACEMENT

A. The Fiber-Form shall be filled with 4000 psi concrete, pumped using the tremie method.

B. The form shall be pumped at a constant slow rate of placement within allowable pressure ratings. The hose shall be removed to a higher port as needed.

3.05 COMPLETION

A. After the pumping process is completed and the grout has cured, all temporary supports shall be removed.

B. The top of each fiberglass form shall be finished smooth.

3.06 INSPECTIONS

A. The Engineer will provide periodic underwater inspections as part of the QA/QC component of the project. Coordinate all work with the Engineer representative to schedule inspections of reinforcing installation, fiberglass form installation and concrete placement operations.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for Item 03310-1 BID ALTERNATE NO. 2 - CONCRETE PILE

ENCAPSULATION shall be made at the contract unit price per each concrete encasement installed complete. This price shall include full compensation for preparation, video inspections, cleaning, forming, pile conflict treatment, reinforcement, concrete placement, curing, testing, and the furnishing of all labor, materials, tools and equipment, and all other incidental work necessary to complete the work under this item, as shown on the Drawings, and as herein specified.

ITEM	DESCRIPTION	UNIT COST
03300-2	BID-ALTERNATE NO.2 – CONCRETE ENCASEMENT	EACH

END OF SECTION

SECTION 05500

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 WORK DESCRIBED

A. Fabrication of new steel members as shown on the Drawings, including, but not limited to, cleats, connection hardware, fixing bolts, waterside plate washers. couplers, end plates, tie-rod extensions and other fabrications as specified herein, and as approved by the Engineer.

1.02 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications. This includes plans, elevations, sections, and details of metal fabrications and their connections and accessories.

B. Submit product data and manufacturers' instructions to Engineer for approval.

C. Delegated-Design Submittal: For installed products indicated to comply with the performance requirements and design criteria, including analysis data signed and sealed by a qualified professional engineer responsible for their preparation.

D. Material Certificates: Provide copies of material certificates signed by material producer and/or subcontractor certifying that each material item complies with or exceeds specified requirements.

E. Welding Certificates

1.03 REFERENCES

A. The following standards (latest edition) shall apply to the work of this Section.

1. American Society of Testing Materials (ASTM):

A36/A36M	Carbon Structural Steel
A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A307	Low-Carbon Steel Externally and Internally Threaded Standard Fasteners
A563	Carbon and Alloy Steel Nuts
F3125	High Strength Structural Bolts

2. American Welding Society (AWS)
   D1.1/D1.1M Structural Welding Code

1.04 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

1.05 REGULATORY REQUIREMENTS

A. All work performed shall conform to the Massachusetts Building Code (MBC) and AWS D1.1/D1.1M.

1.06 TESTS

A. Tests of steel plates and threaded connections will be performed to ensure conformance with requirements stated herein under provisions of the General Conditions.

B. Tensile testing of two (2) tie rod extension fabrications will be completed to confirm an allowable tensile capacity of 60 kips on the tie rod extensions. The Contractor shall submit method and means of tensile tests for review and approval by the Engineer.

C. AWS qualified inspector will perform weld tests in accordance with AWS D1.1.

PART 2 PRODUCTS

2.01 STEEL

A. General.

1. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated.

2. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

3. Steel Plates, Shapes, and Bars: ASTM A36/A36M

4. Steel Bolts and Nuts: Regular hexagon-headed bolts, ASTM A325, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

5. Welding Materials: AWS D1.1; type required for ferrous materials being welded.

6. Tie rods shall be Dywydag or equal, with associated hardware, as indicated on the Drawings.

7. Hurricane Straps: Galvanized Simpson Strong-Tie H2.5A Clip/Tie or approved equivalent.

B. MISCELLANEOUS SHEET PILE STEEL MEMBERS

1. All miscellaneous tie rods, channels, fasteners, wales and hardware shall be as shown by the Drawings.

2. Steel wales, plates and shapes shall be ASTM- A572 Grade 50. HSS members shall conform to the requirements of ASTM A500, Grade B.

3. Bolts, nuts and washers shall be ASTM- A325.

4. Threaded bar shall be Grade 75. Hex nuts, couplers, plates and washers shall be Grade 75.

5. Contractor shall be responsible for the furnishing and timely delivery of miscellaneous members, coordinating material selection with steel sheeting installation.

C. WELDING

1. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal allow welded.

2. Weld corners and seams continuously to comply with the following:

   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance to base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.

2.02 FABRICATION

A. Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Contractor is responsible for verifying dimensions on site prior to submission of shop drawings.

C. Assemblies shall conform to AISC Specification for the Design, Fabrication, and Erection of Structural Steel

D. Assemblies shall be fabricated to within + or – 1/8" of their dimensions.

E. Fabricate items with joints tightly fitted and secured.

F. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 –inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

D. Perform field welding in accordance with AWS D1.1.

E. Install items plumb and level, accurately fitted, free from distortion or defects.

3.02 REPLACE WALE FIXING BOLTS AND TIE ROD EXTENSIONS AND FASTENERS

A. Excavate to below the bottom of the internal wale to expose the deteriorated fixing bolts. Evaluate the condition of the fixing bolts and the tie rods. Seek the engineer's approval for identifying necessary repairs of the tie rods.

B. Remove and replace the wale fixing bolts with the galvanized 1.5” diameter hex headbolts.

C. Remove and replace the 4”x4”x1.5” plate washers at the sheet pile side of the connection.

D. Reuse the existing 1.75”x10”x18X plate on the wale side of the connection, pending it is in fair condition.

E. If tie rods are identified to be repaired by the engineer, excavate fill behind the wall to expose sound rod. Cut the rod at the location of the sound rod and remove the rod connected to the sheet pile wall. Weld the sister tie rod extensions as indicated on the drawings. Install new nut and washer at the end of the tie rod as indicated in the contract drawings.

3.03 DEFECTIVE WORK

A. The following shall be ground for rejection and replaced at no additional cost to the Owner:
   1. Any damaged parts
   2. Any parts improperly installed
   3. Any items found not to have the proper connection
   4. Otherwise not according to the Contract Documents

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. METAL FABRICATION shall not be measured separately for payment. Include costs for Miscellaneous Metals under items where work is included.

END OF SECTION

SECTION 06125

TIMBER DECKING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Timber decking for the construction of the proposed timber pier, and floating dock system bid alternate as shown on the Drawings.

1.02 REFERENCES

A. American Lumber Standards Committee (ALSC)

1. Softwood Lumber Standards.

B. American Society for Testing and Materials (ASTM)

1. A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

2. A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware

3. A307 - Carbon Steel Bolts, Studs, and Threaded Rod

C. American Wood Preservers Association (AWPA)

1. C18 - Standard for Pressure Treatment Material in Marine Construction.

2. M4 - Care of Pressure Treated Wood Products.

D. National Forest Products Association (NFPA)

1. National Design Specification for Wood Construction.

1.03 QUALITY ASSURANCE

A. Lumber Grading Agency: Certified by ALSC.

B. Contractor to provide technical data on wood preservative materials and application instructions.

C. In lieu of grade stamping, Contractor to submit manufacturer's certificate that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber Grading Rules: NFPA.

B. Lumber Decking and Railing: Southern Yellow Pine Grade No. 1 Dry (MC19) or better, S4S.

1. Decking shall be S4S.

2.02 ACCESSORIES

A. Fasteners: Carbon Steel ASTM A307 and galvanized in accordance with ASTM A123 and A153 for exterior and treated wood locations, as shown on Contract Drawings.

2.03 FABRICATION

A. Contractor to verify dimensions and site conditions prior to fabrication.

B. All timber cut or drilled in any manner on-site shall receive penetrating sealer in accordance with AITC requirements.

2.04 WOOD TREATMENT

A. All timber, except oak, shall have pressure treatment in conformance with AWPA M4 and P8 Ammoniacal copper Quatenary (ACQ) in accordance with AWPA C2 and C18 timber exposed to marine borer attack. Decking and timber railing shall have minimum retention of 0.4 pounds per cubic foot. The presence of the AWPB quality mark MLP shall be accepted as evidence of conformance to this specification.

B. All timber shall be supplied at a maximum moisture content of 19%.

C. Cut or drilled surfaces of all timbers shall be treated with a minimum of two saturating coats of copper naphthenate preservative (min. 2% metallic copper) in accordance with AWPA M4 and P8.

PART 3 EXECUTION

3.01 INSPECTION

A. Contractor to verify that surfaces are level and ready to receive decking.

B. Contractor to verify that lumber is dry (MC19) prior to installation.

3.02 INSTALLATION

A. Decking lumber will be placed to the dimensions indicated by the Drawings.

B. Install decking with heartwood down, using 6-inch long deck spikes (2 per intersection). Deck planks shall be spaced 1/4-inch using dry timber.

3.03 SITE APPLIED WOOD TREATMENT

A. Site-sawn ends of timber shall have preservative treatment applied in accordance with manufacturer's instructions. Preservative shall be allowed to cure prior to erecting members.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. TIMBER DECKING shall not be measured separately for payment. Include costs under Contract Items 06130 TIMBER FRAMING.

4.02 PAYMENT

A. TIMBER DECKING shall not be measured separately for payment and shall be included under 06130 TIMBER FRAMING.

END OF SECTION

SECTION 06130

TIMBER FRAMING

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work under this Section shall include the installation of new timber pile caps, stringers, bracing, decking, rails, wales and blocking, and other timber members associated with the Reconstruction of Coal Pocket Pier, and Steamship Pier sister-piles and fender-pile replacement

B. Related Sections: Documents affecting the work in this section include, but are not necessarily limited to, the General Instructions and applicable portions of the following specifications:

Section 02310 TIMBER PILES
Section 05500 MISCELLANEOUS METALS
Section 06125 TIMBER DECKING

1.02 REFERENCES

A. American Lumber Standards Committee (ALSC)

1. Softwood Lumber Standards.

B. American Society for Testing and Materials (ASTM).

1. D245 – Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber

2. D2555 – Standard Practice for Establishing Clear Wood Strength Values

3. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

4. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

5. A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength

C. American Wood Preservers Association (AWPA)

1. C1 - All Timber Products - Preservative Treatment by Pressure Processes

2. C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Process

3. C18 - Standard for Pressure Treated Material in Marine Construction

4. M4 - Care of Preservative-Treated Wood Products

D. American National Standards Institute/American Welding Society

1. D1.1 - Structural Welding Code

E. National Forest Products Association (NFPA)

1. National Design Specification for Wood Construction

F. American Wood Preservers Bureau (AWPB)

1. MLP - Standard for Softwood Lumber, Timber, and Plywood Pressure Treated for Marine (Saltwater) Exposure

G. American Institute of Timber Construction (AITC)

1.03 QUALITY ASSURANCE

A. Lumber Grading Agency: Certified by ALSC.

B. Provide technical data on wood preservative materials and application instructions.

C. In lieu of grade stamping, submit manufacturer's certificate that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 MATERIAL

A. Lumber Grading Rules: NFPA, RIS, SPIB, SFPA, WCLIB and WWPA.

B. Pile Caps, Stringers, Bracing, and other timber members: Southern

Yellow Pine No. 1 Dense, or Douglas Fir Dense No.1.

1. Caps and stringers shall be S2E.

D. All timber, except oak, shall have pressure treatment in conformance with AWPA M4 and P8 chromated copper arsenate (CCA) in accordance with AWPA C2 and C18 timber exposed to marine borer attack. Pile caps, stringers, and cross bracing shall have minimum retention of 2.5 pounds per cubic foot. The presence of the AWPB quality mark MLP shall be accepted as evidence of conformance to this specification.

E. All timber shall be supplied at a maximum moisture content of 19%.

F. Cut or drilled surfaces of all timbers shall be treated with a minimum of two saturating coats of copper naphthenate preservative (min. 2% metallic copper) in accordance with AWPA M4 and P8.

2.02 ACCESSORIES

A. Connectors: Gusset Plates and Hurricane Straps.

B. Bolts, Nuts, Washers, Lags, Screws, and Drift Pins: Medium carbon steel with galvanized coating. Size and type to suit application in conformance with ASTM A153.

C. Washers shall be round steel plate, 3" minimum O.D. and 1/4" minimum thickness, galvanized.

C. Galvanizing: All hardware and plates shall be hot-dipped galvanized after fabrication and threading of stock, in accordance with ASTM-A153.

2.03 FABRICATION

A. Fabricate components in accordance with AITC. Joints shall be neatly fitted, welded, and ground smooth.

2.04 FINISHES

A. Galvanize connectors in accordance with ANSI/ASTM A123 and A153.

2.05 STORAGE

A. Wood products delivered at the site shall be carefully piled, off the ground, in such a manner as to assure proper drainage, ventilation, and protection from the weather.

1. All lumber and timber shall be stored under dry conditions.

2. Care of pressure treated wood products shall comply with AWPA Standard M4.

B. Hardware and fasteners shall be stored in their original containers and under dry conditions until ready for use.

2.06 DECKING

A. Decking shall be in accordance with Section 06125.

PART 3 EXECUTION

3.01 ERECTION

A. Set structural members level and plumb, in correct position as indicated on the Drawings.

B. Make provision for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Holes for machine bolts shall be bored with a bit 1/16" larger than the bolt diameter, and holes for drift bolts shall be 1/16" smaller than the bolt diameter as approved by the Engineer.

D. Drilled holes shall be thoroughly flushed with preservative. Similarly, cut timber surfaces shall be given two brush coats of preservative before installation, in accordance with AWPA M4.

E. All bolts shall bear on round plate washers under the nut and the head.

F. After nuts have been tightened, there shall be at least ½-inch, but not more than 2-inches, of exposed thread beyond the nuts.

G. After erection, touch-up galvanized surfaces with primer consistent with shop coat.

H. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing structural timber to itself, or to in-place construction.

I. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installation of structural timber. Provide temporary bracing as required. For items required to fit previously constructed spaces, take measurements at job and fabricate to fit actual spaces. Repair cut surface with preservative brushed on to dry surface as recommended by the manufacturer.

J. Fit exposed connections accurately together to form tight joints. Cut exposed joints smooth and repair cut surfaces. Do not cut or abrade the surfaces of items which have been hot-dip galvanized.

K. Fastening of one member to another shall be accomplished in such a manner that no cracking or splitting of timber members shall occur. Cracked or split members shall be replaced by the Contractor, to the approval of the Engineer, at no additional cost to the Owner.

3.02 DEMOLITION AND COORDINATION

A. Demolition and legal disposal of existing and/or waste timber members and hardware shall be in accordance with Sections 02100 – DEMOLITION AND REMOVAL.

B. Coordinate pier pile, pile caps, stringers, and decking work so that no undue stresses are placed on individual members during pier installation.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. TIMBER FRAMING shall be measured per thousand board foot installed in place to the lines and elevations shown on the Drawings, as measured by the Engineer, and as specified herein.

4.02 PAYMENT

A. TIMBER FRAMING shall be paid for under Contract Item 06130-1, which price shall include the furnishing of all labor, materials, equipment, and tools; preparation; and all other incidental work necessary to complete the erection of timber pile caps, stringers, decking, appurtenances, and other work under this item as shown on the Drawings, as specified herein, and as approved by the engineer.

B. Payment Items

ITEM	DESCRIPTION	UNIT PRICE
06130-1	TIMBER FRAMING	THOUSAND BOARD FOOT

END OF SECTION

SECTION 16000

ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A. The work under this Section shall consist of installing all conduit, wire and associated equipment required to furnish and install various components of installing the (2) electrical pedestals in Bid Alternate No. 1.

C. All work performed under this Section shall be as specified herein, as shown on the Plans. The Engineer shall have the final decision regarding all disputes on materials and workmanship.

D. All underground installations, including any required wiring, must be complete before the finished surface is placed in the parking areas. All excavations required for the installation of conduit shall be completed prior to placing and compacting gravel subbases.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General & Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.03 DESCRIPTION OF WORK

A. Work to be Performed: The scope of work consists of the installation of all materials to be furnished under this Section, and without limiting the generality thereof, includes:

1. Conduit and Wire
2. Branch Circuit Wiring
3. Handholes
4. Electrical Pedestals

Reference to Drawings: Work to be done under this Section is shown on Drawings and specified herein.

Related Work: The following is not included in this Section and is to be performed under the designated section:

1. SECTION 02210 - EARTHWORK: Excavation and backfill, trenching.

2. SECTION 03300 – 02513 BITUMINOUS PAVEMENT: Pavement patches.

1.04 SUBMITTALS

A. Samples of all materials, along with the certified engineering data and written notification that the proposed materials meet these Specifications must be furnished. Upon approval of the samples and test data, delivery of the proposed materials will be made and no changes or modifications, with the exception of minor changes not affecting operation or appearance will be allowed.

B. In the event that a modification or change to the approved materials, or the development of new material to replace approved materials is announced by the supplier, written notification must be given to the Engineer. An option to accept delivery of the modified or new material or continued delivery of the approved material must be given. In no case shall the delivery of the new or modified material result in any additional expense to the Contract.

C. Shop Drawings shall be submitted for approval to the Engineer for the following, but not limited to, materials:

1. Conduit
2. Wire
3. Handholes
4. Electrical Pedestals

E. A written full one year complete replacement guarantee against defects in materials and workmanship for a period of one year from date of final acceptance of this Contract shall be furnished with all material. Defects in any material shall be replaced at the expense of the Contractor.

1.05 QUALITY ASSURANCE

A. The Contractor shall comply with the regulations of all authorities having jurisdiction over electrical work, shall arrange for all inspections that may be required by the HDC, shall obtain all permits and certificates at the contractor's own expense, and shall deliver to the Engineer certificates of acceptance of work.

B. The Contractor shall comply with all standards and regulations of all utilities involved governing all materials and methods of construction. All work, materials and construction methods shall be in accordance with all utilities involved, except as otherwise specified herein.

C. Trade names and catalog numbers mentioned on the Drawing, or in these Specifications, are used for the purpose of furnishing a brief description of the material. Similar materials will be accepted if, in the opinion of the Landscape Architect, they are equal in quality and operation to those specifically mentioned. Only materials approved by the National Board of Fire Underwriters, and so labeled, will be considered for approval for the services indicated.

D. All material must have the name or trademark of the manufacturer stamped thereon, where such identification is customary. All electrical equipment shall be designed, manufactured, tested and rated in accordance with the latest applicable standards of the National Electric Manufacturers Association (NEMA), the American Institute of Electrical Engineers (AIEE), American National Standards Institute (ANSI), and the American Society for Testing and Materials (ASTM).

1.07 ACCEPTANCE

A. All systems shall be complete-in-place to the satisfaction of the Engineer (complete systems must by totally operational) prior to the final acceptance of this work. Payment for any unit does not constitute final acceptance of that unit. The Contractor shall familiarize himself with the requirements for testing and final acceptance of completed underground utilities and lighting systems as called for in the Contract Specifications, under the appropriate items.

B. The Contractor is responsible for all equipment until final acceptance of the Contract and for all damage from any cause whatsoever.

C. The Contractor shall anticipate the problems inherent in coordination of his work with required issuance of work orders to all utilities involved, and the subsequent scheduling by the utilities.

D. It should be noted that the Electrical work depicted on the drawings are schematic and the Contractor shall coordinate actual locations of equipment with the Engineer.

E. No payments will be made for relocation’s required because of improper installation by the Contractor.

1.08 NAMEPLATES

A. The Contractor shall furnish and install on the panelboards a typed directory in factory installed frame protected with plastic.

1.09 CODES, STANDARDS AND REFERENCES

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

B. In case of difference between building codes, State Laws, Local Ordinances, Industry Standards and Utility Company regulations and the Contract Documents, the Contractor, where such conflict exists shall promptly notify the Engineer in writing of any such difference.

C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.

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

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

F. Building Codes:

1. Massachusetts Electrical Code
2. Occupational Safety and Health Standards
3. National Fire Protection Association
4. Massachusetts State Building Code
5. Americans with Disabilities Act

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

1. ANSI American National Standards Institute
2. ASTM American Society of Testing Materials
3. UL Underwriters' Laboratories
4. NEMA National Electrical Manufacturers Association
5. FM Factory Mutual
6. MEC Massachusetts Electrical Code
7. ADA Americans with Disabilities Act

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

1.10 GUARANTEE

A. Attention is directed to provisions regarding guarantees and warranties for work under each Trade.

B. Manufacturers shall provide their standard guarantees for work under the Electrical Trade. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer and/or Contractor may have by law or by other provisions of the Contract Documents.

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

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

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

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

1.11 THE CONTRACTOR

A. The Contractor shall visit the site and make his bids from his own site examinations and estimates and shall not hold the Engineer, the Owner or his agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof.

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

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

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

1.12 COORDINATION OF WORK

A. The Contractor shall compare his respective drawings and specifications with those for other trades and report any discrepancies between them to the Engineer and obtain from the Engineer written instructions for any changes necessary in the electrical work. All work shall be installed in cooperation with other trades installing interrelated work. Before installation, all trades shall make proper provisions to avoid interference in a manner approved by the Engineer. All changes required in the work of the trades caused by their neglect shall be performed by them as herein before specified.

B. Locations of conduit and equipment shall be adjusted to accommodate the work with interference anticipated and encountered. The Contractor shall determine the exact routing and location of the systems prior to fabrication or installation.

C. The Contract Drawings are diagrammatic only intending to show general runs and locations of conduit, equipment, terminals and specialties and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom. In case of conflict between conduit sizes shown on plans, details or diagrams, the larger conduit size shall be included under the Contract where such discrepancy occurs.

1.13 GIVING INFORMATION

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

1.14 FAILURE

A. The Contractor shall obtain detailed information from the manufacturer of apparatus which he is to furnish and/or install indicating the proper method of installing and connecting same.

B. The Contractor shall obtain detailed information from the manufacturer of apparatus which he is to furnish and/or install indicating the proper method of installing and connecting same. The Contractor shall also obtain all pertinent information from the General Contractor and other Contractors which may be necessary to facilitate his work and the completion of the whole project.

1.15 DRAWINGS, INFORMATION AND INTERPRETATION OF SAME

A. The Engineer shall interpret the specifications and the detailed developments and the drawings thereof. The Engineer's interpretation shall be final and binding.

B. The Engineer shall interpret the specifications and the detailed developments and the drawings thereof. The Engineer’s interpretation shall be final and binding.

1.16 BITUMINOUS/CONCRETE WORK

A. All concrete, bituminous pavmenet, and masonry equipment bases and pads, curbs, chases, pockets and openings (except core-drilling) required for the proper installation of the work under this Contract, will be provided by the General Contractor using dimensions, templates, bolts, anchors, as shown on the drawings, or as required or recommended by the equipment manufacturers.

B. Anchor bolts, sleeves, inserts and supports that may be required shall be furnished and installed by the Contractor for the items to be supported. Any expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports provided under this Section shall be paid for by the Contractor.

1.17 USE OF PREMISES

A. The Contractor shall confine his apparatus, storage of materials and construction to the limits directed by the Engineer and he shall not encumber the premises with his materials.

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

C. Not withstanding any approvals or instructions which must be obtained by the Contractor from the Engineer in connection with use of premises, the responsibility for the safe working conditions at the site shall remain that of the Contractor and the Engineer or Owner shall not be deemed to have any responsibility or liability in connection therewith.

D. For additional requirements see also the requirements set forth in the General Requirements.

1.18 PROTECTION

A. Materials, conduit shall be properly protected and all conduit openings shall be temporarily closed so as to prevent obstruction and damage as described herein before. Post notice prohibiting the use of all systems provided under the Contract prior to completion of work and acceptance of all systems by the Owner except otherwise instructed by the Engineer or herein before specified. Contractor shall take precautions to protect his materials from damage and theft.

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

1.19 EQUIPMENT AND MATERIALS

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

B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned, polished thoroughly and turned over to the Owner in a condition satisfactory to the Engineer. Damage or defects developing before acceptance of the work shall be made good at the respective Contractor's expense as herein before specified.

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

D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment. Notify the Electrical Engineer in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the Engineer's written instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or the written instructions issued by the Engineer, he shall bear all costs arising in correcting any deficiencies that should arise.

E. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his contract for use, occupancy and operation by the Owner.

F. Where equipment of the acceptable manufacturers require different arrangement or connections from those shown, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Engineer, the Contractor proposing substitutions shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all necessary changes in all affected related work provided by other Trades, including location of roughing-in connections by other trades and supports. All changes shall be made at no increase in the Contract amount or additional cost to the Owner.

G. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified herein before. Where such acceptance is contingent upon having the products listed or labeled by FM or UL or other testing laboratory, the products shall be so listed or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

H. All equipment of one type (such as wiring devices, panelboards) shall be the products of one manufacturer.

1.20 DAMAGE TO OTHER WORK

A. The Contractor shall be held responsible and shall pay for all damages caused by his work to the new and existing building structures, and new and existing equipment, conduit, systems and all work and finishes installed under this Contract in the existing building. Repair of such damage shall be done by the Contractor at his own expense, to Engineer's satisfaction.

1.21 CORRECTION OF WORK

A. The Contractor shall promptly correct all work provided under his Contract and rejected by the Engineer as defective or as failing to conform to the Contract Documents whether observed before or after completion of work and whether or not fabricated, installed or completed. The Contractor responsible for defective work shall bear all costs of correcting such rejected work to Engineer's satisfaction.

1.22 TOUCH-UP PAINTING

A. All equipment and conduit systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The Contractor for the work under his Contract shall refinish and restore to the original condition all equipment which have sustained damage to the manufacturer's prime and finish coats of Paint and/or enamel.

1.23 IDENTIFICATION OF MATERIALS

A. All equipment used in the Electrical Systems shall have a permanently attached nameplate identifying the manufacturer, service, size, serial number or model number, etc. The nameplates shall be kept clean and readable at all times.

PART 2 PRODUCTS

2.01 SCHEDULE 40 PVC CONDUIT

A. Conduits of the sizes shown on the plans shall be schedule 40 PVC construction with standard wall thickness. The conduit must be free from defects and foreign matter. All bends, fittings, and clamps shall be new and free from defects. Bends of all conduit must be made using a standard type commercial bending device.

B. The schedule 40 PVC conduit must conform to and meet all the current requirements and testing procedures of the American Society for Testing and

Materials whenever such standards and tests shall apply. The following ASTM standards shall apply as applicable:

ASTM Specification A120-73 - Schedule 40 - PVC Conduit

All conduit shall bear distinctive marking of the type, size, manufacture, etc., to verify that the conduit meets the special conditions of the specifications. The Contractor must supply to the Landscape Architect a letter of compliance from the manufacturer stating that the conduit meets all specifications and conditions.

2.02 COUPLINGS AND FITTINGS

A. Conduit couplings and fittings shall be constructed of polyvinyl chloride rigid plastic formed to fit the outside diameter of the conduit, to be used in conjunction with a heavy bodied solvent cement.

ASTM D2564 - Specifications for Solvent Cements for Polyvinyl Chloride Plastic Pipe and Fittings.

2.04 HANDHOLES

A. Contractor shall furnish and install grade mounted handholes as indicated on the drawings.

B. Grade mounted handholes shall be of polymer concrete construction suitable for installation in sidewalks as manufactured by Quazite “PG” style or equal.

2.06 FEEDER AND BRANCH CIRCUIT CONDUCTORS

A. All feeder, branch circuit, remote control, signal circuit and interlock wiring shall be manufactured of copper, rated 600 volts unless noted otherwise.

B. Minimum size wire for branch circuit and power wiring shall be #12 AWG.

C. Insulation type shall be XHHN for feeders and power wiring, THHN./THWN for lighting, remote control, signal circuit wiring.

D. All exterior wiring shall be Type XHHW unless otherwise indicated on the drawings.

E. Color coding for phase identification shall be as follows:

<u>240/120 volts</u>
A Phase - Red

B Phase - Black
Neutral - White
Ground - Green

Color coding shall be continuous on insulation for #6 AWG or smaller and continuous or marked with color tape at all connections for conductors larger than #6 AWG.

F. All wiring shall conform to the Massachusetts Electrical Code for construction and use.

G. All wiring shall be installed in conduit.

2.07 SOLDERLESS LUGS AND CONNECTORS

A. All lugs for feeder conductors and connectors for branch circuit joints shall be of the solderless type suitable for copper wire.

2.08 GROUNDING

A. Provide grounding for all electrical equipment and devices in accordance with the applicable requirements of the Massachusetts Electrical Code and as indicated on the drawings.

B. Bonding jumpers shall be installed at all locations required by MEC.

2.09 ELECTRICAL PEDESTALS

A. Contractor shall furnish and install all electrical pedestals as indicated and as specified on the drawings.

B. Contractor shall submit shop drawings and manufacturer specifications for approval by the engineer.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all local and state codes.

3.02 INSTALLATION OF RACEWAYS

A. Where conduits enter or leave disconnect switches, junction boxes, controllers, etc., a standard locknut shall be used on the outside and inside (where required) of the box.

3.04 INSTALLATION OF BOXES

A. All FS boxes shall be rigidly mounted and shall be equipped with suitable screw fastened covers.

B. Mounting hangers, clamps, etc., for electrical equipment shall be as indicated on the drawing and as required.

3.05 INSTALLATION OF CONDUCTORS

A. All wiring shall be installed and supported in accordance with the requirements of the Massachusetts Electrical Code

B. Splices, taps and lugs shall be electrically and mechanically secure and solderless lugs and connectors shall be used. Lugs shall be used for conductors sizes No. 8 AWG and larger. All lugs shall be of the proper size and in no case shall strands be cut from a conductor in order to fit the conductor into a lug.

3.06 INSTALLATION OF ELECTRICAL PEDESTALS

A. Furnish and install electrical pedestals including conduit, wire, outlet boxes, receptacles, and switches as required.

B. Where job conditions require locations different from those shown to avoid equipment, etc., such changes shall be made without additional cost to the Owner.

3.07 BRANCH CIRCUITS

A. The branch circuit wiring shall be installed as indicated on the drawings.

B. The number and size of conductors in each run of conduit is indicated on the drawings and where there is a conflict between the number wires indicated and the actual number required, the actual number and size shall be installed.

C. All branch circuits shall be connected to breakers at the Contractor's discretion. The balancing of all loads shall be the Contractor's responsibility.

3.08 EQUIPMENT CONNECTIONS

A. All equipment shown on the drawings shall be connected under this section.

B. Before connecting any piece of equipment, check the nameplate rating against the information shown on the drawings and call to the attention of the Electrical Engineer any discrepancies.

C. The Contractor shall carefully study all equipment manufacturer's wiring diagrams and make corrections accordingly.

3.09 IDENTIFICATION OF EQUIPMENT

A. Identification shall be provided for all electrical equipment. The electrical system Identification shall clearly describe the equipment connected. Method of Identification shall be by laminated nameplate made of bakelite or similar material engraved letters at least 1 1/4" high and secured to the equipment by screws. A list of nameplates shall be submitted to the Electrical Engineer for approval prior to fabrication.

B. Panelboard directory cards shall be typewritten to indicate areas and/or devices served by each circuit.

3.10 TESTS

A. This Section of the Specifications shall include the making of the necessary tests referred to herein in the presence of the Engineer to show that the particular system or equipment has been properly installed and is in good operating condition, as hereinafter specified. The Electrical Engineer shall be notified two (2) weeks in advance of the date for all tests so that he may be present to witness the tests.

B. Complete test and inspection records shall be made and incorporated into a report for each piece of equipment tested. All readings, taken shall be recorded. Test reports shall be submitted to the Engineer for approval.

C. Furnish necessary meters, instruments, temporary wiring and labor to perform all required tests and adjustments of equipment and wiring installed and/or connected under this Contract, including electrical equipment furnished by others, to determine proper polarity, phasing, freedom from ground and shorts and operation of equipment. All measuring instruments shall be properly calibrated.

D. All materials and manner of installation shall be in strict accordance with the applicable requirements of state and local authorities, the utility company and the codes of National Board of Fire Underwriters.

E. Wherever any of the aforementioned codes, laws, etc., require that any work be tested or approved, the Contractor shall provide proper facilities for access and for inspection, all at his own expense.

F. Wiring

1. System and equipment grounds shall be checked for proper value of resistance using the Megger ground tester in accordance with manufacturer's standard instructions.

2. The Contractor shall correct or replace any nominal current-carrying circuit which is defective or grounded and he shall also correct all other troubles encountered by these tests. All defects whether through faulty workmanship or material furnished shall be corrected under this Section at the Contractor's expense.

G. Electrical Outlets:

1. Check all electrical outlets for proper operation.

H. Branch Circuits:

1. The branch circuit wiring shall be installed as indicated on the drawings. No major changes in wiring shall be made without the approval of the Engineer in writing.

2. Number associated with each branch circuit outlet identifies the branch circuit to which the device served by the outlet is to be connected. The circuit number indicated is only for reference and guidance to this Contractor and is not intended to limit the panelboard circuitry. All branch circuits shall be connected to breakers at Subcontractor's discretion, in accordance with circuit requirements. The balancing of all loads shall be this Contractor's responsibility.

3.11 FINAL INSPECTION

A. When the work on this project has been completed and is ready for final inspection, such inspection will be made. At this time, the Contractor for the work of this SECTION shall demonstrate that the requirements of these specifications have been met. Written results for all tests shall be submitted to the Engineer.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. ELECTRICAL shall be measured as the lump sum for electrical and electrical pedestal installation.

4.02 PAYMENT

A. ELECTRICAL shall be paid for under Contract Item Bid Alternate-1 – Electrical Pedestals, which lump sum price shall include full compensation for furnishing and installing fixtures, conduit, cable, handholes, receptacles, and all other material, equipment, labor, and incidental or appurtenant work required to install the lighting as shown on the Drawings, as specified herein, and as approved by the Engineer. Demolition of the existing electrical service and connections are not included in this item, and shall be paid for under Section 02100.

End of Section