DIVISION 1 - GENERAL REQUIREMENTS

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SECTION 011000
SUMMARY OF WORK

PART 1 - GENERAL

All work specified herein and presented on the contract drawings shall conform to or exceed the requirements set forth in the Contract Documents. In case of conflict between codes, reference standards, drawings, permits, and other contract documents, the most stringent requirements shall govern. The work comprises the provision of all labor, materials, tools, transportation, etc. necessary to construct the project in accordance with the Contract Documents.

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Safety Precautions.
5. Site Maintenance.

1.2 PROJECT INFORMATION

A. Project Name: Henry C. Chambers Waterfront Park Relieving Platform Project

1. Project Location: Downtown Beaufort, SC

1.3 WORK COVERED BY CONTRACT DOCUMENTS AND CONTRACT

A. The work as identified in the Contract Drawings includes, but is not limited to:

- Installation of pile jackets on 33 piles
- Installation of epoxy grout at repaired piles

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract based on a stipulated sum and time required to complete the project.

1.5 COMMENCEMENT AND COMPLETION OF WORK

A. The Contractor shall commence work as directed by the City of Beaufort on the date of the Notice to Proceed.

B. All work required by the Contract Documents shall be completed within 120 calendar days after the commencement of the work, as defined by the notice to proceed.

1.6 SUBMISSION OF INFORMATION

Submit the following information with the initial bid or when requested by the Owner:

A. Designation of the work to be performed by the Contractor with his own forces and a list of Subcontractors and their designated work.
B. List of manufacturers and suppliers of specified materials to be used.
C. Contractor's Schedule of Values
D. Bid Bond

1.7 INSURANCE

A. In addition to any certificates of insurance for liability, automobile and workers compensation as required by the City of Beaufort, Marine Contractors shall provide marine insurance, specifically USL&H and Jones Act coverage for working over water or from a vessel as applicable.

1.8 BONDS

A. The Contractor shall submit a 5 percent bid bond with their bid. A payment and performance bond for 100 percent of the work will be required.

1.9 ACCESS TO SITE

A. General: During the construction period the Contractor shall have use of Project site for construction operations as indicated on the drawings, as indicated by requirements of this Section, and as specified by the Engineer or Owner.

B. Material storage and work areas shall be as designated by the Owner.

C. Use of Site: Limit use of Project site to Construction area indicated. Do not disturb portions of Project site beyond areas in which the work is indicated.

D. Limits: Confine construction operations to the area affected by construction.

E. The Contractor will be able to park in the general vicinity of the work site. The Contractor may or may not be assigned an area in the general vicinity of the site for storage of material.

1.10 WORK RESTRICTIONS, NOTIFICATIONS, AND COORDINATION

A. Coordinate all work being performed on a daily basis with the Owner, Engineer, and other agencies having jurisdiction.

B. Comply with all requirements set forth by US Coast Guard, US Army Corps of Engineers, and any other agencies having jurisdiction.

C. On-Site Work Hours: Limit work to normal business working hours of 7:30 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

D. Submit request to the Owner at least 72 hours in advance for permission to work outside the normal working hours or on Saturdays, Sundays, or federal holidays.

E. Submit request to the Owner at least 72 hours in advance of any utility interruptions.

F. Obtain Owner’s written permission before proceeding with any utility interruptions.

G. Take action to prevent the spread of construction dust or debris. All debris relating to the demolition or construction activities shall be removed from the waterway, Contractor’s laydown

area, and from the site at the Contractor's expense.

H. Sanitation Facilities: The Contractor shall provide temporary toilet, wash facilities, and drinking water for use by Contractor's personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1.11 SAFETY PRECAUTIONS

A. These construction documents and the construction work hereby contemplated shall be governed at all times by applicable provisions of federal regulations, including, but not limited to, the current edition, with the latest amendment(s) of the following:

B. William-Steiger Occupational Safety and Health Act of 1970, Public Law 91-596; Part 1926 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations (29 CFR Part 1926).

C. The Contractor shall notify the local fire department at least 24 hours prior to the start of any construction practices which may affect or impair any fire protection system or which may present a fire hazard (i.e., sanding, welding, grinding, applying hot tar, burning and utilizing of any flame producing device).

D. The Contractor shall have and maintain an appropriate functioning fire extinguisher in the work area, for the type of work being done and the materials present. The Contractor shall comply with OSHA, NFPA, and other local safety regulations.

E. The Contractor shall determine and employ all necessary safety precautions to protect the general public and Contractor or Subcontractor personnel during construction operations.

F. Work vessels, barges, and other waterborne equipment must display the appropriate day shapes and/or lighting configurations as required by the US Coast Guard. In addition, all vessels shall have the appropriate safety equipment on board each vessel as required by OSHA and the US Coast Guard.

1.12 SITE MAINTENANCE

A. The Contractor shall perform daily clean-up of work site, dumpsters and storage area. All dumpsters shall be covered and watertight.

B. The Contractor shall ensure that barges, work vessels, and equipment are secured and moored in a safe manner prior to completing work each day. Contractor shall coordinate the location of equipment and vessels left overnight with the US Coast Guard.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets
      b. Submittal schedule
      c. Items required to be indicated as separate activities in Contractor's construction schedule
   2. Submit the schedule of values to Engineer at earliest possible date, but no later than 30 days before the date scheduled for submittal of initial Applications for Payment.
   3. Sub-schedules: Where the Contractor's construction schedule defines separate elements of the work and/or phasing, provide sub-schedules showing values coordinated with each element and/or each phase.

B. Format and Content: Use Project specifications table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Owner's project number.
      c. Contractor's name and address.
      d. Date of submittal.

   2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.
      g. Dollar value.

   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project specifications table of contents. Provide multiple line items for principal subcontract amounts, where appropriate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the work.

7. Allowances: Provide a separate line item in the schedule of values for each Allowance, if applicable. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and Final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use Standard AIA Forms or other forms acceptable to Engineer for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the work claimed as substantially complete.
   1. Include documentation supporting claim that the work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the work.

F. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. Evidence that any claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Wherever possible throughout the contract documents the minimum acceptable quality of workmanship and materials has been defined either by manufacturers name and catalog number with the salient characteristics or by reference to recognized industry standards.

B. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the Engineer.

C. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Submittals: Written and graphic information or physical samples that require Engineer's responsive action.

1.3 SUBMITTALS

A. Submittals for the project are indicated throughout the Contract Documents and are presented in tabular form at the end of this Section.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Make all submittals of shop drawings, samples, request for substitutions and other items in strict accordance with the provisions of this section of these specifications.

B. All submittals shall be reviewed by the Contractor before submitting to the Engineer.

C. All submittals shall be provided to the Engineer within 30 calendar days of NTP.

D. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the work are indicated.

3. Coordinate transmittal of submittals for related parts of the work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

E. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. No extension of the Contract Time

will be authorized because of failure to transmit submittals enough in advance of the work to permit processing, including resubmittals.

1. Initial Review: Allow (5) five working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.

2. Contractor shall provide resubmittals to Engineer or Owners Representativewithin (5) five working days of receipt of disapproved submittal. Five days starts at the earliest date disapproved submittal is received, i.e. electronically or hard copy.

3. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

4. Resubmittal Review: Allow the same number of days for review of each resubmittal, as in the initial review.

F. Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Owner.

3. Include the following information for processing and recording action taken:
    a. Project name
    b. Date
    c. Name of Contractor
    d. Name of subcontractor
    e. Name of supplier
    f. Name of manufacturer
    g. Submittal number or other unique identifier, including revision identifier
    h. Number, paragraph number and title of appropriate Specification Section
    i. Drawing number and detail references, as appropriate
    j. Location(s) where product is to be installed, as appropriate
    k. Other necessary identification

4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner will return without review submittals received from sources other than Contractor.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Owner's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final submittals that are marked with approval notation from Owner action stamp.

1. Submittals returned “approved as noted” are only approved if contractor and manufacturer concur with the comments, if not, the submittal is rejected and must be resubmitted.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product.

1. Manufacturers catalog sheets, brochures, diagrams, schedules, performancecharts, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, products, or models.

2. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

3. Mark each copy of each submittal to show which products and options are applicable.

4. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work. Fully illustrate requirements in the Contract Documents.

2. Modify manufacturer's standard schematic drawings as necessary to provide additional information applicable to project.

D. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

E. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

F. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

G. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

H. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation

of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

I. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

J. Warranties: Submit warranty information for installed products.

K. Maintenance Information: Submit manufacturer's maintenance requirements for the products specified.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.

B. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineering review of submittals.

C. Contractor’s responsibility for deviations in submittals from requirements of contract is not relieved by review of submittals Owner or Engineer gives written acceptance of specific deviation.

3.2 OWNER’S ACTION

A. Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

C. Submittals not required by the Contract Documents may be returned by the Ownerwithout action.

D. Begin no work that requires submittals until return of submittals with Engineering approval and initials or signature indicating review.

Specification Section	Submittal Item	Date Submitted	Date Reviewed	Comments
011000 - 1.6A	List of Subcontractors			
011000 - 1.6B	List of Manufacturers			
011000 - 1.6C	Contractor's Schedule of Variables			
01100 - 1.6D	Bid Bond			
011000 - 1.7	Certificate of Insurance			
011000 - 1.8	Payment and Performance Bond			
012900 - 1.3	Schedule of Values			
015000 - 1.3A	Construction Site Plan			
033950 - 1.2	Warranty			
033950 - 1.2	Shop Drawings			

SECTION 013400
HEAVY WEATHER PLAN

PART 1. GENERAL

The requirements of this section do not supersede requirements set forth by the United States Coast Guard or other agencies having jurisdiction. Where there is a difference in requirements, Contractor shall follow the more stringent guideline.

1.1 The Contractor shall generate a Heavy Weather Plan in the event of Hurricane or Storm Conditions. This plan will require the completion of specific tasks prior to the arrival of a hurricane / storm. The intent is to reduce the project site's exposure to damage, allowing return of service as rapidly as possible after the hurricane / storm passes.

1.2 The Contractor and subcontractors shall be in a general condition of readiness during the hurricane season, which runs from June 1 to November 30 each calendar year.

1.3 In the event of heavy weather, Contractor shall not moor vessels, barges, boats or other waterborne equipment to existing or newly installed structures. Contractor shall not secure or tie down equipment to any existing or newly installed structures. Contractor shall move all materials, equipments, and waterborne vessels to a secure location.

1.4 Any damage to existing or newly installed structures as a result of failure by the Contractor to move or secure equipment, material, and vessels from the construction site during periods of heavy weather shall be repaired at no additional cost to the Owner.

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PART 2 HEAVY WEATHER PLAN

2.1 Contractor Responsibilities

A. Contractor shall have heavy weather plan in place and notify superintendents, personnel and subcontractors of required actions during heavy weather. The heavy weather plan shall address actions that include but are not limited to:

1. Contractors shall ensure personnel are aware of requirements for securing work site in preparation for storm (e.g., contractors, trailers, and equipment).
2. Waste pick up
3. Emptying storage or tool sheds
4. Removing portable toilet facilities
5. Removing potential missile hazards on site
6. Moving machinery, equipment, vessels and barges to a secure location.

END OF SECTION 013400

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511 (2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly FCCCHR List(continuously updated) List of Approved Backflow Prevention Assemblies FCCCHR Manual(l988e9) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241(2009) Standard for Safeguarding Construction, Alteration, and Demolition Operations

NFPA 70(2011; Errata2 2012) National Electrical Code

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA) MUTCD(2009) Manual of Uniform Traffic Control Devices

1.3 SUBMITTALS

Engineer approval is required for all submittals. Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

A. Construction Site Plan

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas, which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

PART2 PRODUCTS

2.1 TEMPORARY CONTROLS

A. Barricades

1. Erect and maintain temporary barricades to limit public access to hazardous areas. Securely place barricades and make clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

B. Fencing and Life Safety Signage

2. Prior to the start of work, enclose those areas at the construction site which are not within the construction fence with a temporary safety fence, including gates and warning signs, to protect the public from construction activities. The safety fence shall be bright orange where it protects work areas, shall be made of high density polyethylene grid or approved equal plastic fence from recovered materials containing 60-100 percent recovered content level plastic, a minimum of 42 inches high, supported and tightly secured to steel posts located on minimum 8 foot centers. Remove the fence from the work site upon completion of the contract.

3. "Danger Construction Area" signs shall be posted along the site and on the construction fence at intervals not to exceed 20 ft. Maintenance of the warning signage shall be the sole responsibility of the Contractor.

C. Temporary Wiring

1. Provide temporary wiring, as needed, in accordance with NFPA 241 and NFPA 70, Article 305-6(b), Assured Equipment Grounding Conductor Program. Include frequent inspection of all equipment and apparatus.

2.2 EMPLOYEE PARKING

1. Contractor employees will park privately owned vehicles in an area designated by the Owner's representative. This area will be within reasonable walking distance of the construction site.

2. Contractor employee parking must not interfere with existing and established parking requirements of the Owner.

2.3 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Utilities

1. Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

B. Sanitation

1. Provide temporary sewer and sanitation facilities that are self-contained units with both urinals and stool capabilities. Ventilate the units to control odors and fumes and empty and clean them at least once a week or more often if required by the owner. The doors shall be self-closing. Locate the facility behind the construction fence or out of the public view.

C. Fire Protection

1. Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

2.4 TRAFFIC PROVISIONS

A. Maintenance of Traffic

1. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the SCDOT and local authorities have been met.

B. Protection of Traffic

1. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Engineer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

2.5 CONTRACTOR'S TEMPORARY FACILITIES

A. Safety

1. Protect the integrity of any installed safety systems or personnel safety devices. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Engineer.

B. Storage Area (If necessary)

1. Designate a temporary area around equipment and materials. Do not place or store trailers, materials, or equipment outside the designated area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Engineer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items, which are in support of ongoing work on any given day. Do not stockpile materials outside the designated area in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the designated area at the end of each workday.

C. Maintenance of Storage Area

1. Keep storage area in a state of good repair. Grassed or unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways. Should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor'sdiscretion.

D. Security Provisions

1. Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

2. When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storm is of lesser intensity pose a threat to the work or any nearby Owner property.

2.6 TEMPORARY PROJECT SAFETY FENCING

Prior to commencing other work, furnish and erect temporary project safety fencing at the work site. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 8 foot centers, constructed at the approved location. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, will become the property of the Contractor and be removed from the work site.

PART 3 EXECUTION

3.1 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Remove daily any trash, debris, or waste that may attract animals. Any dirt or mud, which is tracked onto paved or surfaced roadways, must be cleaned away. Store within the fenced area described above or at the supplemental storage area any materials resulting from demolition activities, which are salvageable. Neatly stacked stored materials not in trailers, whether new or salvaged.

3.2 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore to the original or better condition, areas used by the Contractor for the storage of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its original condition, including topsoil and seeding as necessary.

END OF SECTION 015000

SECTION 017300
EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Installation of the work.
   3. Cutting and patching.
   4. Progress cleaning.
   5. Protection of installed construction.
   6. Correction of the work.

1.2 DEFINITIONS

Refer to individual specifications sections for information and requirements regarding definitions of work items in **Section 017300 1.1A** not listed herein.

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work or general repair work as specified on the Contract Drawings.

1.3 SUBMITTALS

Refer to individual specifications sections for information and requirements regarding required submittals.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
   2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
   4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed

surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner for the visual appearance and will equal or surpass functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the work.

1. Before construction, verify the location and points of connection of utility services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

C. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes and primers.
2. Review proposed cutting areas for potential interferences and conflicts. Coordinate procedures and resolve potential conflicts before proceeding.

D. Written Report: Where a written report listing conditions detrimental to performance of the work is required by other Sections, include the following:

1. Description of the work.
2. List of detrimental conditions, including substrates.
3. Recommended corrections.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Engineer that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving any facilities unless permitted by written permission from the Owner.

C. Field Measurements: Take field measurements as required to fit the work properly. Recheck measurements before installing each product. Where portions of the work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of

Contractor, submit a Request For Information to Engineer.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

3.4 INSTALLATION

A. General: Locate the work and components of the work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

G. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

H. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with all State, Federal and Local regulations concerning the removal of waste material and debris.
   2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   3. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

F. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

G. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

H. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed work is without damage or deterioration at time of Substantial Completion.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction.

B. Restore permanent facilities used during construction to their specified condition.

C. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 033950
PILE ENCAPSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

Surface preparation of each identified square precast concrete pile to be encapsulated; fabrication and placement of a translucent, fiberglass reinforced plastic (FRP) jacket around each specified square precast concrete pile to the limits specified in the Contract Drawings; and injection of a water insensitive epoxy grout into the space between the jacket and the remaining profile of a precast concrete pile once unsound concrete has been removed. The epoxy grout is batched, mixed and pumped by equipment, expressly designed for that purpose.

1.2 SUBMITTALS

A. Shop Drawings - Shop drawings, prepared by the Contractor, shall be reviewed and approved by the Engineer prior to commencement of the work. Shop drawings shall demonstrate conformance with the pile jacket plan details included in the construction documents and the technical properties listed in the materials sections to follow.

The list of shop drawings shall include, but not necessarily be limited to:

1. Length of typical jacket.

2. Details and locations of typical longitudinal and transverse joints in the outer FRP jackets, including a description of the joint connection and sealing method(s).

3. Pattern of fixed and/or adjustable stand-offs for each FRP outer jacket.

4. Detail of the typical FRP outer jacket bottom seal and a description of when it is required for use.

5. Location and details of temporary bracing and FRP outer jacket support required during placement and curing of epoxy grout.

6. Details of injection ports or other access points into the FRP outer jacket to facilitate placement of epoxy grout. Details of installation sequence to be used to place the epoxy grout in the space between FRP outer jacket and precast concrete pile.

7. Detail of final finishing of epoxy grout at top of the FRP outer jackets or alternate details for pile jackets ending at or just below a pile cap or slab.

8. Details of permanent closure of all injection ports after epoxy grout curing is complete.

B. Grout Handling Equipment - Prior to commencement of the work, the Contractor shall submit for approval, the make, model and manufacturer of each major piece of equipment he intends to use in the proportioning, mixing and pumping of the epoxy grout.

C. Material Data - Prior to commencement of the work, the Contractor shall submit for approval, Manufacturer's data sheets for each material to be used in the pile encapsulation work.

D. Contractor shall submit a 1 year warranty for the material and installation of the pile encapsulation system starting the date of project acceptance (final completion).

E. Quality Control Plan as outlined in Part 3 of this specification.

1.3 QUALITY CONTROL

A. Contractor is responsible for quality control throughout all phases of construction, from the initial pile cleaning to the final pile encapsulation. Contractor is advised that the City's representative for the project, and Engineer of Record (McSweeney Engineers), will be performing underwater construction inspection and verification throughout the course of the project. Engineer of Record will ensure compliance with the design plans and specifications and will ultimately approve the work and applications for payment.

PART 2 PRODUCTS

2.1 MATERIALS

A. SQUARE (FRP) Fiberglass Encasement

1. Description - The translucent outer jacket shall be a marine grade laminate of fiberglass reinforced plastic (FRP), constructed of layers of woven roving and mat. Construction by the spray-up process, using a chopper gun, is not acceptable. The glass content shall be sufficient to meet the strength requirements found in Section 2.1.A.6, herein, but shall not be less than 30 of the laminate. A ultra-violet (UV) screening ingredient shall be integrally bound within the polyester matrix.

2. Strength and Thickness - The strength and thickness of the FRP outer jacket shall be as required to provide adequate strength and rigidity to withstand the forces and stresses it may be subject to during handling, installation, injection and curing of the epoxy grout, but shall not be less than 1/8 inch thick.

3. Translucence - The FRP outer jacket shall be translucent to the extent that the progression of epoxy grout inside the jacket during injection can be visually monitored from outside the jacket.

4. Injection Ports - The FRP outer jacket shall be equipped with 1 inch or larger NPT injection ports, spaced at intervals not to exceed five (5) feet, along its entire length. The injection ports shall be positioned on alternately opposite sides of the FRP outer jacket to allow for more even distribution of grout. The injection ports shall be of all-polymer construction and be fitted into the FRP

outer jacket wall prior to jacket installation, except in special situations,

approved by the Engineer in writing, where a port may be added to accommodate an unanticipated jobsite condition.

5. Stand-Offs - The FRP outer jacket shall have a sufficient number of polymer stand-offs (FSM Spacers), adhered to its inside surface, to maintain a minimum space between the original pile profile and the jacket of 1 inch, unless otherwise noted in the plans. The use of threaded polymer set screws as adjustable stand-offs, in combination with fixed stand-offs or in lieu of fixed stand-offs, to meet specific project requirements, is permitted. In particular, adjustable standoffs are required where a loss of concrete pile section exists. At an adjustable stand-off location, a polymer boss shall be adhered to the inside surface of the jacket to provide adequate thread length to accommodate the set screw.

6. Physical Properties (excluding polymer stand-offs and injection ports)

   a. Ultimate Tensile Strength per ASTM 0-638: 20,000 PSI

   b. IZOO Impact Strength per ASTM 0-256: 20 ft-Ibs/inch. (Notched Sample)

   c. Barcol Hardness per ASTM 0-2583: 40 (Minimum).

   d. Water Absorption per ASTM 0-570: 0.3 (Maximum).

   e. Ultra-Violet (UV) Stability as demonstrated by Accelerated Weathering Tests per ASTM G-153: Samples of outer jacket subjected to 500 hour exposure in Twin Carbon Arc Weather-ometer (ASTM G-153, Type D) operated at 145 degrees F., shall not exhibit any chipping, flaking or peeling in twenty (20) minute cycles, consisting of seventeen (17) minute arc light and three (3) minutes of water spray, throughout the 500 hour test duration.

   f. Flexural Strength per ASTM D-790: 34,000 PSI

   g. Flexural Modulus per ASTM D790: 1,000,000 PSI

7. Fabrication - The FRP outer jacket may be fabricated in a single piece or be made up of sections. Each section shall not contain more than two (2) longitudinal joints. All joints in the outer jacket shall meet the following minimum requirements:

   a. All joints shall have sufficient strength to assure that they will not open or separate when subjected to installation stresses, sea forces and epoxy grout injection or curing pressures.

   b. All joints shall be of overlapping configuration and allow for minor field adjustment of pile size while maintaining a minimum overlap length as specified in the plan documents.

   c. Transverse joints or splices (where required) shall be of overlapping configuration with at one side of the joint possessing a molded upset shape.

8. FRP Jacket Ends - The lower end of each FRP outer jacket shall be provided with a molded upset cavity to properly receive and contain a bottom seal gasket or as required to splice pile jacket segments together. The molded upset cavity at the jacket bottom may be omitted if past project performance

demonstrates that it is not required to maintain a properly functioning bottom seal to the pile jacket. The use of this end treatment must be addressed in the required project submittals.

B. Pile Jacket Epoxy Grout

1. Product Description - The epoxy grout shall be a manufactured, prepackaged, solvent-free, three component product, consisting of epoxy resin (component A), epoxy hardener (component B) and graded dry silica aggregate filler (component C). The A and B components shall be of sharply contrasting colors, as supplied to the project, to minimize error in field proportioning and to assist in evaluating thoroughness of mixing. Alternatively, if the A and B components are both transparent, mixing shall be evaluated by the absence of streaking in the transparency of the combined mixture. The grout shall be proportioned to meet the handling and placement requirements of this specification and the ratio of the filler to binder shall not exceed 3.5: 1, by weight. The mixed grout shall be
capable of curing underwater to the characteristic properties listed below.

2. Characteristics - The mixed epoxy grout shall exhibit the following characteristics in the plastic state:

   a. Viscosity of filled resin and filled curing agent shall be such that it may be pumped without segregation and injectable in to the space between jacket and pile without causing distortion or rupture of the jacket. The viscosity shall also be such that the blended grout completely fills the space between the jacket and pile without voids and be reasonably self leveling, once placed within the jacket.

   b. The gel time or "Pot Life" of the blended grout shall be suitable for proper placement without voids, and allow sufficient time for reasonable self leveling within the jacket, yet in no case shall exceed 90 minutes after blending at a control temperature of 70 degrees F, unless specified as less working time by the manufacturer. (This requirement minimizes the possibility of the filler settling out of the liquid components.)

   c. The blended grout shall be uniform in color and not contain any pockets or streaks of the original component colors.

3. Properties - The catalyzed Epoxy Grout, after curing under water, shall possess the following minimum physical properties in the hardened state. Maximum limits are shown as (Maximum).

   a. 7 Day Compressive Strength per ASTM C-579 B: 8,500 PSI

   b. 7 Day Tensile Strength per ASTM C-307: 2,000 PSI

   c. 7 Day Bond/Shear Strength per ASTM C-882: 2,200 PSI Minimum

   d. Shrinkage after 7 day's cure per ASTM C-531: 0.0 (Maximum)

   e. Water Absorption after 7 day's cure per ASTM C-413: 0.0 (Maximum)

C. Marine Epoxy Paste

1. Seam and Gasket Epoxy Paste - The epoxy paste used to adhere the FRP outer jacket seams and bottom seal gaskets, shall be a two component epoxy compound, capable of being applied underwater. The ratio of resin component to hardener component shall be 1: 1 by volume and each component shall be of sharply contrasting color to the other, to assists in evaluating the thoroughness of jobsite mixing.

2. Finishing Epoxy Paste - The epoxy paste used to finish the tops of the encapsulations as indicated in the plan documents and to seal all in-situ bond test locations, shall be a non-sag, two component epoxy compound, capable of being applied underwater. The ratio of resin component to hardener component shall be 1: 1 by volume and each component shall be of sharply contrasting color to the other, to assist in evaluating the thoroughness of jobsite mixing.

E. Epoxy Grout Hose Lubricant - The material used to lubricate the pumping equipment and hoses must be an epoxy-reactive diluent, compatible with the chemistry of the epoxy grout used.

2.2 EQUIPMENT

A. Handling Equipment - The epoxy grout shall be handled by equipment expressly designed for mixing and pumping aggregate filled epoxy grouts. The equipment may pump the proportioned epoxy grout through lines directly or utilize the plural component method for epoxy grout. In the plural component method the reactive components are kept separate during batching, pre-mixing and pumping, to be blended at the downstream end of the hoses, just prior to entering the jacket. Hand or power mixing of the components in the original shipping containers is not permitted; however, mixing may be done in separate clean containers prior to introducing to the pump. The equipment shall be capable of delivering mixed grout or concrete through hoses into the jackets at a rate of 3 GPM or greater.

B. Temperature Control Equipment - Provide a source of heated water, such as a diver's water heater, when ambient temperatures are expected to fall below 70°F. Direct the heated water into water jackets surrounding the epoxy grout hoppers and injection hoses(s). Use equipment capable of delivering sufficient amount of heater water to maintain grout viscosity suitable for proper grout placement. Consideration for the air and water temperature along the grout pumping path must be considered and accounted for.

2.3 MATERIAL HANDLING AND STORAGE

A. Handling and storage of pile encapsulation materials shall strictly conform to the stricter of the manufacturer's recommendations or the following list of minimum handling and storage requirements:

1. FRP Outer Jackets - FRP Outer jackets shall be shipped in closed containers or covered with tarpaulins to prevent contamination by dirt or road films. Outer jackets shall be stored on end at the job site, to minimize distortion and to prevent contamination by foot traffic and blown debris. If storage at project is to exceed 30 days, shaded storage shall be provided.

2. Epoxy Grout Components

a. Silica Aggregate - The silica aggregate component of the epoxy grout shall be properly packaged and labeled to indicate point of origin and manufacturer's lot number. The aggregate shall be stored to assure that it is thoroughly dry when mixed in the epoxy grout. See storage section below for additional requirements.

b. Liquid Components - All liquid epoxy components to be used in the work shall be delivered to the job site in tightly sealed unopened containers, clearly labeled to indicate:

(1) Name of manufacturer.

(2) Manufacturer's product's name and component designation.

(3) Manufacturer's lot number and "Manufacture" date.

(4) ANSI (American National Standards Institute) hazardous material rating and handling precautions.

c. Storage - All components of the encapsulation epoxy grout (A, B, Aggregate) shall be stored together in a covered, well ventilated space. The storage temperature of the liquid and aggregate components shall not exceed 120 degrees F nor be less than 50 degrees F at any time after receipt by the Contractor. Follow Manufacturer storage guidelines if more strict than the range provided above. It is imperative to store the components at like temperatures to avoid adversely affecting the reactivity of the blending of the components.

d. Containers - Containers containing liquid epoxy components shall always be sealed and air tight from time of receipt by Contractor until entering the proportioning and blending process. When containers are opened for sampling or other purposes and containers remain partially filled, their lids will be tightly closed to prevent contamination by moisture or other substances. Once the seal has been broken on a container, its contents must be used within seven (7) days or removed from the project.

e. Safety - All project personnel handling the epoxy grout or its liquid components shall be properly alerted to the Epoxy Safety Requirements supplied by the manufacturer. A Material Safety Data Sheet (MSDS) shall be supplied with each shipment of liquid epoxy materials and maintained in the job site trailer for employee information.

PART 3 EXECUTION

3.1 PREPARATION

A. Pile Preparation -

1. Prior to application of the encapsulation process, all pile surfaces shall be thoroughly cleaned of marine growth, oil, grease, mud, rust, broken or unsound concrete, corrosion products from any exposed reinforcement steel, micro-organisms and any other deleterious material which might prevent proper bonding between the epoxy grout or structural concrete and the pile. It is recommended that pile cleaning be accomplished by high pressure water

blasting, at a minimum. Other methods that produce the quality of cleaning necessary to meet the bond requirements of these specifications such as grit blasting or by divers using powered rotary abraders or needle guns may be considered.

2. Produce a finished surface/substrate over the entire area to be encapsulated which results in a bond strength between epoxy grout and the pile surface, equal to or greater than that required by this specification (Section 2.1.B.3)

3. When necessary, perform the pile cleaning in 2 phases where active marine growth occurs. In the first phase, a maximum of 7 days before encapsulation, remove marine growth, oil, grease, rust, and broken concrete, etc. In the second phase, a maximum of 48 hours before placement of epoxy grout in the outer pile jacket, perform a final surface preparation, removing all remaining deleterious substances including microorganisms.

B. FRP Surface Preparation - The entire inside surface of each FRP outer jacket shall be lightly grit blasted to remove any bond breaking residue that may be present. Alternatives to grit blasting of the inside face of the jackets must be submitted with the initial material submittals for review. A throughout description of the alternative surface treatment is required. In addition, documentation of prior testing and successful installation of pile jackets using the proposed surface treatment shall be included in the submittal.

C. Epoxy Grout Preparation / Proportioning - Proportioning and mixing of the epoxy grout shall be accomplished with equipment expressly designed for that purpose and shall be performed in a suitable work area within the available hose distance of the piles to be encapsulated. Proportioning of the silica aggregate and the liquid epoxy components for epoxy grout shall be performed in strict accordance with the manufacturer's recommendations, with particular regard to temperature control. When ambient and/or water temperatures are expected to fall below 70 degrees F., the day's supply of grout filler and liquid components shall be pre-heated to above 80 degrees F., but never greater than 120 degrees F., prior to being introduced into the grout handling equipment. In no case shall open flame be used in direct contact with the equipment or the epoxy components.

3.2 INSTALLATION

A. FRP Outer Jacket

1. All fixed stand-offs or adjustable stand-off bosses shall be affixed to the FRP outer jacket in accordance with approved shop drawings. Alternatively, the standoffs may be affixed to the existing concrete pile within the profile of the jacket in a pattern consistent with the contract plan requirements to maintain the minimum required annulus.

2. FRP outer jacket assembly and positioning around the pile shall be performed in such a manner as to assure that no damage to stand-offs, steel rivets or screws at joint jacket locations occurs. The spacing between individual fasteners shall not exceed 3 inches, unless otherwise noted in the plan documents. In addition the jacket shall be placed and secured such that no detrimental movement of the joints will occur while the joint adhesive is curing.

3. The FRP outer jacket shall be supported by temporary bracing or other means to assure that it will not move or distort during the epoxy grout placement and curing period, and that the minimum annular space of 1 inch between pile and

FRP outer jacket is maintained throughout the entire encapsulation, unless otherwise noted in the plan documents.

4. Each FRP outer jacket shall be fitted with a bottom seal gasket to prevent the epoxy grout from leaving the bottom of the FRP outer jacket during the injection and curing process. The gasket shall be fitted into the molded cavity at the lower end of the FRP outer jacket and adhered in place with marine epoxy paste. Any gasket material used in the bottom seal, shall be contained within the molded cavity and shall not extend up into the FRP outer jacket above the cavity. Any gasket material extending below the profile of the jacket upon removal of the temporary jacket bracing shall be removed.

5. The longitudinal seams shall be sealed with marine epoxy paste described in 2.1.C and fastened with 3/16" diameter stainless steel pop rivets or self-tapping screws of sufficient length to completely penetrate the overlap seam/joint.

B. Epoxy Grout Placement (Injection)

1. Before the injection process begins, at least 2-1/2 gallons of an approved grout hose lubricant shall be placed in each grout hopper. This lubricant shall be pumped through the entire system to coat all wetted surfaces of the hopper(s), pump(s) and hoses. When the lubricant level has reached the bottom of the hopper(s), it may be immediately followed by the epoxy grout and the remaining lubricant "chased" out of the hoses. Some of the lubricant, which is not intermixed with the epoxy grout, may be collected at the downstream end of the hoses for re-use.

2. The premixed, aggregate filled epoxy grout shall be pumped through a hose to the FRP outer jacket injection ports. If the plural component method of grout handling is used, the separate aggregate filled components shall be pumped through separate hoses to the mixer/blender assembly, where the components are then thoroughly blended and catalyzed just prior to entering the FRP outer jacket. No free fall pouring of the grout material is allowed.

3. Injection shall begin at the bottom injection port. As the grout appears at the next higher port, and it has been determined that the space between the pile and the FRP outer jacket is filled to that port, the lower port shall be capped off and the injection begun at the next higher port where the grout appeared. This process is repeated from port to port until the grout reaches the top of the FRP outer jacket. NOTE: If project experience indicates that the grout can be injected from a lower port, past the next higher port or ports, without difficulty or undo stress on the FRP outer jacket, the higher port or ports may be plugged and bypassed. The plugs shall be a minimum of 1 inch NPT, Schedule 40, PVC, CPVC or Polypropylene.

4. At the Contractors' option, he or she may inject a short lift of grout (six inches to 1 foot in height) into the bottom-most port and allow it to cure before proceeding with subsequent lifts. If this practice is used, the FRP outer jackets shall be fitted with an additional injection port to coincide with the top of the first lift. Subsequent lifts of grout or concrete will follow the procedure above.

5. The injection process shall be continuous, except for brief interruptions when the injector is moved from port to port, and the speed of the injection process shall be controlled to prevent entrapment of water or air in the cavity being filled.

6. The maximum permissible voids in the epoxy grout within the jackets shall not exceed 0.01 square foot per one (1) square foot of encapsulation area. Any voids larger than two (2) inches diameter shall be repaired, using an approved method, at the Contractor's expense.

C. Final Finishing and Inspection

1. After the injection process is completed and the grout has sufficiently cured to the compressive strength values listed herein, all temporary support for the FRP outer jacket shall be removed.

2. Following bracing / support removal, all pile jackets observed with potential voids between the pile jacket and the epoxy grout shall be tested to determine the extent of the voids. Remediation of these areas, where present, will be performed at the Contractor's expense and there shall be no additional payment for piles requiring testing, verification, and additional repairs (as necessary) for voids.

3. The exposed epoxy grout at the top of each encapsulation shall be finished with the marine epoxy paste or as shown in the approved alternate top finish method for a pile installed flush with the bottom of a pile cap. See the contract drawings for additional information.

3.3 QUALITY CONTROL

A. Program - The Contractor shall prepare a detailed, project specific, Quality Control program, which will be reviewed by the manufacturer and approved by the Owner prior to the commencement of work. At a minimum, the Quality Control program, will define areas of responsibility, lines of authority and communication, specific inspections and number of tests, record keeping and any other activities related to the quality of permanent materials and workmanship that become part of the completed work. The manufacturer will provide guidelines and suggestions pertaining to the pile encapsulation process for inclusion in the Contractor's Quality Control program.

B. On-Site Technical Service - The manufacturer shall provide on-site technical service at the beginning of the project, and on an as-needed basis at no additional cost to ensure that their procedures and recommendations are met.

PART 4 COMPENSATION

4.1 MEASUREMENT

Measurement for progress payment will be based on the linear feet of jacket satisfactorily installed and incorporated into the project relative to the total bid unit of measure.

4.2 BASIS OF PAYMENT

A. Payment will constitute full compensation for the satisfactorily completed work including, but not limited to, all material, equipment, and labor costs of the cleaning, removal of unsound concrete on all pile faces for 1 LF of pile up to a depth required to reach sound concrete, the jacket, epoxy grout, and any other work required to satisfactorily construct and verify (test) the installation of each jacket per the Contract Documents.

B. Bid Item extensions are computed in accordance with the quantities and unit prices stated and reflect full compensation for a complete, finished product.

C. Quantities stated in the Bid may be adjusted on order of the Owner. The cost or credit to the Owner shall be computed in accordance with the unit prices stated under the applicable Bid Item.

D. No addition or separate payment will be made for additional surface preparation, pile top treatments or time necessary for Owner's verification.

E. No partial payment will be made for jackets that have not been completely installed or have not been shown to comply with the technical specifications (damaged or rejected).

F. No quantity adjustment will be made for work performed outside of the specified work areas, extents shown on the contract documents, or additional damage to a pile resulting in a change in repair type.

END OF SECTION 033950