

**SECTION 01 01 00  
GENERAL REQUIREMENTS**

**PART 1 PROJECT DESCRIPTION**

1.01 GENERAL

- A. A brief description of the work is stated in the Invitation to Bid. To determine the full scope of the project or any particular part of the project, coordinate the applicable information in the several parts of these Contract Documents.
- B. The work under this Contract shall be performed by the Contractor as required by the Owner. Work will be authorized in the form of a Notice to Proceed issued to the Contractor. The Contractor shall complete all work in the Contract within the number of calendar days stipulated in the Contract unless an extension in the time of completion is granted by the Engineer, as stated in the Instructions to Bidders. Upon completion of the work and compliance with applicable provisions in the Contract Documents, the Contractor will receive final payment for all work done.
- C. The following additional information, though not all-inclusive, is given to assist contractors in their evaluation of the work required to meet the project objectives.
- D. This Project will provide Owner with a new bulkhead at Zero Duval and associated improvements.
- E. The work is likely to be influenced by the tides. The tides can have an effect on the timing and work schedule. No extra claims shall be made for the tides or for other natural causes.
- F. The Contractor shall become familiar with the existing operating conditions of the Owner's facilities and take such into consideration in planning and scheduling work. No extra claims shall be made for work required to achieve conditions beyond those obtainable under normal operation of the existing sanitary facilities necessary to accomplish the Work.
- G. The Contractor shall be responsible for providing a licensed surveyor registered in the State of Florida. Surveyor shall verify all benchmarks used during survey.
- H. Contractor shall adhere to and provide equipment, resources and construction methods that meet all requirements of the provided Environmental permits both ACOE and FDEP as provided in Part 4 of this package.

- I. Contractor shall be responsible to prepare, apply for and obtain SWPPP, Water Use and Dewatering permits for construction activities on this project.

## **PART 2 SEQUENCE OF OPERATIONS**

### 2.01 SCHEDULING

#### A. General:

1. Submit estimated progress schedule and preliminary schedule of submittals in duplicate to Engineer. Updated progress schedules and submittal schedules shall be submitted with each partial pay request.
2. Revise and resubmit as specified, and identify all changes made from previous schedule submittal.

#### B. Construction Schedule:

1. Within 10 days following approval of the Shop Drawings and after establishment of equipment delivery dates the Contractor shall provide a bar chart analysis of the required construction work for the Project. All activities should be shown along with the required time to do the work in a proper and continuous sequence of operation and without delays.
2. Show complete sequence of construction by activity, identifying work of separate stages, and other logically grouped activities. Indicate dates for early and late start, early and late finish, float, and duration.
3. Any contingency within the schedule (i.e., a difference in time between the project's early completion and required Contract completion date) and the float in the overall project schedule will belong to the project and not to the parties to the Contract. Contractor shall not sequester shared float through such strategies as extending duration estimates to consume available float time, extensive crew/resource sequencing, etc.
4. Provide a workable plan for monitoring the progress of all elements of the work, establish the critical elements of work, and forecast potential problems in maintaining the specified completion dates.

#### C. Schedule of Submittals:

1. Schedule of Submittals: Indicate submittals required by Specification section number with brief description, starting and completion dates for respective submittal preparation, and submittal review by Engineer.
2. Indicate product manufacture and delivery dates.

- D. Plan the work and carry it out with minimum interference to the operation of the existing facilities. Prior to starting the work, confer with the Engineer and Owner's representative to develop an approved work schedule which will permit the facilities to function normally as practical. It may be necessary to do certain parts of the construction work outside normal working hours in

order to avoid undesirable conditions. The Contractor shall do this work at such times, and at no additional cost to the Owner. Do not make connections between existing work and new work until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the Contract Documents.

- E. No work shall be started until the Contractor has received approved shop drawings, established material/delivery dates for all equipment, and received approval of the construction schedule from the Engineer. The Contractor shall have sufficient manpower, equipment, and material to complete the Project. No work shall commence without express consent of the Engineer.

## 2.02 COORDINATION

- A. Contractors shall cooperate in the coordination of their separate activities in a manner that will provide the least interference with the Owner's operations and other contractors and utility companies working in the area, and in the interfacing and connection of the separate elements of the overall Project work.
- B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the Engineer.
- C. All contractors working on the site are subject to this requirement for cooperation and all shall abide by the Engineer's decision in resolving project coordination problems without additional cost to the Owner.
- D. Contractor may be asked to stop work during Special Events. No work will be allowed for intersections (To Be Determined) on days corresponding to the events. All material and equipment shall be totally off all streets by 5:00 p.m. the day before. Contractor is responsible to obtain a schedule of Special Events from the Owner. A preliminary schedule is included in Exhibit K of Section 00 73 00.

## 2.03 SHUTDOWN OF EXISTING OPERATIONS OR UTILITIES

- A. Continuous operation of the Owner's existing wastewater system are of critical importance. The Contractor's work shall not result in the interruption of stormwater disposal, sewage, water, or solid waste service to any customers.
- B. Any work that requires the temporary shutdown of any existing operations or utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the utility, Owner, and Engineer. Advance notice shall be given in order that the utility, Owner, and Engineer may witness the shutdown, tie-in, and startup. The temporary shutdown must be approved by the Owner. All tie in and bypass operations shall be the responsibility of the

Contractor and are considered incidental to the cost of construction and provided at no additional cost to the Owner.

- C. All materials and equipment (including emergency equipment) necessary to expedite the tie-in shall be on hand prior to the shutdown of existing services or utilities.

2.04 OPERATION OF EXISTING SYSTEM PROHIBITED

- A. At no time undertake to close off any utility lines or open valves or take any other action which would affect the operation of the existing utility systems, except as specifically required by the Drawings and Specifications and after approval is granted by the Owner or Facility Owner. Request approval 5 working days in advance of the time that interruption of the existing system is required. Florida Key Aqueduct Authority (FKAA) water valves can be operated only by FKAA personnel.

2.05 PROGRESS OF CONSTRUCTION

- A. *No* excavated material shall be cast on streets or adjacent sidewalks.
- B. Cleanup construction debris, excess excavation, excess materials, and completely restore fences, mailboxes, ditches, culverts, signposts, and similar items immediately following the final backfilling.

**PART 3 SITE CONDITIONS**

3.01 SITE INVESTIGATION AND REPRESENTATION

- A. The Contractor acknowledges satisfaction as to the general nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions, the character of equipment and facilities needed preliminary to and during the prosecution of the work, and all other matters which can in any way affect the work or the cost thereof under this Contract.
- B. Failure by the Contractor to become acquainted with the physical conditions and all the available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the work.
- C. The Contractor warrants that as a result of examination and investigation of all the aforesaid data, the Contractor can perform the work in a good and workmanlike manner and to the satisfaction of the Owner. The Owner assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of this Contract, unless (1) such

representations are expressly stated in the Contract, and (2) the Contract expressly provides that the responsibility therefore is assumed by the Owner.

### 3.02 INFORMATION ONSITE CONDITIONS

- A. General: Any information obtained by the Engineer regarding site conditions, subsurface information, groundwater elevations, existing construction of site facilities as applicable, and similar data will be available for inspection at the office of the Engineer upon request. Such information is offered as supplementary information only. Neither the Engineer nor the Owner assumes any responsibility for the completeness or interpretation of such supplementary information.

### 3.03 UTILITIES

- A. The Contractor shall be responsible for determining, at his cost, the locations of all utilities within the project area, and shall be responsible for contacting each utility for location and notification prior to commencing work.

### 3.04 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

- A. Where the Contractor's operations could cause damage or inconvenience to utilities, telephone, television, power, water, or sewer systems, the operations shall be suspended until all arrangements necessary for the protection of these utilities and services have been made by the Contractor with the owner of the utility affected.
- B. Notify all utility offices which are affected by the construction operation at least 48 hours in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for all existing underground utilities.
- C. The Contractor shall be solely and directly responsible to the Owner and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the construction operations under this Contract.
- D. Neither the Owner nor its officers or agents shall be responsible to the Contractor for damages as a result of the Contractor's failure to protect utilities encountered in the work.
- E. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said

authority in restoration of service as promptly as possible and bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is granted.

- F. In the event the Contractor encounters water service lines that interfere with trenching, he may, by obtaining prior approval of the property owner, Florida Keys Aqueduct Authority, or Fire Department as applicable, and the Engineer, cut the service, dig through, and restore the service with similar and equal materials at the Contractor's expense.
- G. The Contractor shall replace, at his own expense, all existing utilities or structures removed or damaged during construction, unless otherwise provided for in these Contract documents or ordered by the Engineer.

### 3.05 INTERFERING STRUCTURES

- A. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground.
- B. Protect underground and aboveground existing structures from damage, whether or not they lie within the limits of the easements obtained by the Owner. Where such existing fences, gates, sheds, buildings, or any other structure must be removed in order to properly carry out the construction, or are damaged during construction, restore to their original condition to the satisfaction of the property owner involved at the Contractor's own expense. Notify the Engineer of any damaged underground structure, and make repairs or replacements before backfilling.
- C. Without additional compensation, the Contractor may remove and replace in a condition as good as or better than original, such small miscellaneous structures as fences, mailboxes, and signposts that interfere with the Contractor's operations.

### 3.06 FIELD RELOCATION

- A. During the progress of construction, it is expected that minor relocations of the work will be necessary. Such relocations shall be made only by direction of the Engineer. If existing structures are encountered which prevent the construction, and which are not properly shown on any Contract Drawings, notify the Engineer before continuing with the construction in order that the Engineer may make such field revisions as necessary to avoid conflict with the existing structures. If the Contractor shall fail to so notify the Engineer when an existing structure is encountered, and shall proceed with the construction despite this interference, he shall do so at his own risk.

### 3.07 EASEMENTS

- A. Where portions of the work are located on public or private property, easements and permits will be obtained by the Owner, except as otherwise noted in these Specifications. Easements will provide for the use of property for construction purposes to the extent indicated on the easements. Copies of these easements and permits are available upon request to the Owner. It shall be the Contractor's responsibility to determine the adequacy of the easement obtained in every case and to abide by all requirements and provisions of the easement. The Contractor shall confine his construction operations to within the easement limits or street right-of-way limits or make special arrangements with the property owners or appropriate public agency for the additional area required. Any damage to property, either inside or outside the limits of the easements provided by the Owner or street rights-of-way, shall be the responsibility of the Contractor as specified herein. The Contractor shall remove, protect, and replace all fences or other items encountered on public or private property. Before final payment will be authorized by the Engineer, the Contractor will be required to furnish the Owner with written releases from property owners or public agencies where side agreements or special easements have been made by the Contractor or where the Contractor's operations, for any reason, have not been kept within the construction right-of-way obtained by the Owner or the street right-of-way.
- B. It is anticipated that the required easements and permits will be obtained before construction is started. However, should the procurement of any easement or permit be delayed, the Contractor shall schedule and perform the work around these areas until such a time as the easement or permit has been secured.

### 3.08 PROTECTED VEGETATION

- A. Trees and shrubs are regulated and protected in Key West. All trimming and pruning shall be done in accordance with City guidelines. This work will be considered incidental to the Project costs. Contractor shall obtain such guidelines and gain approvals before commencing work.

## **PART 4 TEMPORARY CONSTRUCTION UTILITIES AND FACILITIES**

### 4.01 TEMPORARY WATER

- A. The Contractor shall make his own arrangements to obtain suitable water and shall pay all costs.

### 4.02 TEMPORARY ELECTRIC POWER

- A. The Contractor shall make arrangements to obtain and pay for electrical power used until final acceptance by the Owner.

4.03 SAFETY REQUIREMENTS FOR TEMPORARY ELECTRIC POWER

- A. Temporary electric power installation shall meet the construction safety requirements of OSHA, state and other governing agencies.

4.04 SANITARY FACILITIES

- A. The Contractor shall provide and maintain sanitary facilities for his employees and his subcontractors that will comply with the regulations of the local and state departments of health and as directed by the Engineer.

4.05 STORAGE OF MATERIALS

- A. Materials shall be stored based on manufacturer's instructions including pre- and post-storage meggering as to ensure the preservation of their quality and fitness for the work. When considered necessary they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground. Stored materials shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the Owner or lessee.
- B. Delicate instruments and materials subject to vandalism shall be placed under locked cover and, if necessary, provided with temperature control as recommended by the manufacturer.

**PART 5 SAFETY AND CONVENIENCE**

5.01 SAFETY EQUIPMENT

- A. The Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities or unramped grade changes in pedestrian sidewalk or walkway, and trenches or excavations in roadway. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. All barricades and signs shall be clean and serviceable, in the opinion of the Engineer.
- B. During construction, the Contractor shall construct and at all times maintain satisfactory and substantial temporary chain link fencing, solid fencing, railing, barricades or steel plates, as applicable, at all openings, obstructions, or other hazards in streets, sidewalks, floors, roofs, and walkways. All such barriers shall have adequate warning lights as necessary, or required, for safety. All lights shall be regularly maintained, and in a fully operational state at all times.

5.02 ACCIDENT REPORTS

- A. In addition, the Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Engineer.
- B. If a claim is made by anyone against the contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

#### 5.03 SAFE ACCESS BY FEDERAL, STATE, AND LOCAL GOVERNMENT OFFICIALS

- A. Authorized representatives of the state, federal, or local governmental agencies, shall at all times have safe access to the work, and the Contractor shall provide proper facilities for such access and inspection.

#### 5.04 TRAFFIC MAINTENANCE AND SAFETY

- A. Provide traffic maintenance plans where required by federal, state, county, or local agencies having jurisdiction.
- B. Comply with all rules and regulations of the state, county, and city authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by express permission of the Owner. Conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. Protect all obstructions within traveled roadways by installing approved signs, barricades, and lights where necessary for the safety of the public. The convenience of the general public and residents adjacent to the project, and the protection of persons and property are of prime importance and shall be provided for in an adequate and satisfactory manner.

#### 5.05 PROTECTION OF PROPERTY

- A. Protect stored materials located adjacent to the proposed work. Notify property owners affected by the construction at least 48 hours in advance of the time construction begins. During construction operations, construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to his residence or place of business for a period exceeding 8 hours, unless the Contractor has made special arrangements with the affected persons.
- B. The Contractor shall identify and isolate his work zone in such a manner as to exclude all personnel not employed by him, the Engineer, and the Owner.

5.06 FIRE PREVENTION AND PROTECTION

- A. The Contractor shall perform all work in a fire-safe manner. He shall supply and maintain on the site adequate fire-fighting equipment capable of extinguishing incipient fires. The Contractor shall comply with applicable federal, state, and local fire-prevention regulations. Where these regulations do not apply, applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241) shall be followed.

5.07 ACCESS FOR POLICE, FIRE, AND POSTAL SERVICE

- A. Notify the fire department and police department before closing any street or portion thereof. No closing shall be made without the Owner's approval. Notify said departments when the streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without special written permission from the fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access.
- B. The Contractor shall leave a night emergency telephone number or numbers with the police department, the Engineer, and the Owner, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.
- C. Maintain postal service facilities in accordance with the requirements of the U.S. Postal Service. Move mailboxes to temporary locations designated by the U. S. Postal Service, and at the completion of the work in each area, replace them in their original location and in a condition satisfactory to the U.S. Postal Service.

5.08 CLEANUP PROCEDURES FOR HURRICANE WARNINGS AND HURRICANE WATCHES

- A. In the event that the National Oceanographic and Atmospheric Administration (NOAA), issues a hurricane watch for the Florida Keys, the Engineer will contact the Contractor informing him that the watch has been established within 4 hours of the notice. The Contractor shall implement the approved plan and schedule describing how and when the Contractor will remove all unnecessary items from the work area and tie down all remaining supplies and barricades in the event that a hurricane warning is issued. If a warning is issued, the Contractor shall remove all unnecessary items from the work area(s) and shall tie down all movable (under 200 pounds) objects. The Engineer will determine "necessary" items. The Owner will not be liable for any financial hardship or delays caused as a result of demobilization or remobilization due to the above.

**PART 6      PRESERVATION, RESTORATION, AND CLEANUP****6.01      SITE RESTORATION AND CLEANUP**

- A. At all times during the work, keep the premises clean and orderly, and upon completion of the work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.
- B. Stockpile excavated materials in a manner that will cause the least damage to adjacent lawns, grassed areas, gardens, shrubbery, or fences, regardless of whether these are on private property, or on state, county, or city rights-of-way. Remove all excavated materials from grassed and planted areas, and leave these surfaces in a condition equivalent to their original condition.
- C. All existing drainage ditches and culverts shall be reopened and graded and natural drainage restored. Restore culverts broken or damaged to their original condition and location as an incidental cost of construction.
- D. Upon completion of backfilling operations, hand-rake and drag all former grassed and planted areas, leaving all disturbed areas free from rocks, gravel, clay, or any other foreign material. The finished surface shall conform to the original surface, and shall be free-draining and free from holes, ruts, rough spots, or other surface features detrimental to a seeded area.

**6.02      FINISHING OF SITE, BORROW, AND STORAGE AREAS**

- A. Upon completion of the project, all areas used by the Contractor shall be properly cleared of all temporary structures, rubbish, and waste materials and properly graded to drain and blend in with the abutting property. Areas used for the deposit of waste materials shall be finished to properly drain and blend with the surrounding terrain.

**6.03      STREET CLEANUP DURING CONSTRUCTION**

- A. Thoroughly clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation. Sidewalks, unless under construction, shall be kept clear of material, and available for pedestrian use at all times.

**6.04      DUST PREVENTION**

- A. Give all unpaved streets, roads, detours, haul roads or disturbed areas used in the construction area an approved dust-preventive treatment or periodically water to prevent dust. Applicable environmental regulations for dust prevention shall be strictly enforced.

6.05 PRESERVATION OF IRRIGATION AND DRAINAGE DITCHES, AND INLETS

- A. After backfilling of the trenches, restore all irrigation and storm drain ditches destroyed, damaged, or otherwise modified during construction to a condition equivalent, in the opinion of the Engineer, to the condition of the ditch before construction. Ditches so reconstructed shall be built in their original locations. All inlets shall be periodically cleaned and kept free of siltation.

**PART 7 SUBMITTALS DURING CONSTRUCTION**

7.01 RECORD DRAWINGS

- A. The Contractor shall maintain a complete set of record drawings to show any items which differ from those shown on Drawings. Such Drawings shall be updated daily and submitted each month with the partial pay request. Final record drawings will be required before substantial completion can be certified and final payment can be made.
- B. The Contractor shall keep the Engineer apprised on a weekly basis, by providing Drawing mark-ups of the items that differ.
- C. All elevations and coordinates shall be verified by a licensed surveyor. The surveyor shall certify the Record Drawings.

**PART 8 PRE- AND POST-CONSTRUCTION VIDEO RECORDINGS**

8.01 GENERAL

- A. The Contractor shall provide color videos showing the pre-construction site, and the post-construction site. The videos shall be in digital (DVD) format, the video shall indicate on the DVD the date, job title, and brief description of the video and location where the video was taken. Video shall be subject to review and approval by Engineer. Two copies of the video DVD (including the original) shall be delivered to the Engineer as follows:
  - 1. A video shall be taken of the preconstruction conditions, as well as all storage and staging areas, and the property adjacent to the construction sites. Particular emphasis should be directed to roadway conditions as well as all right-of-way features that will be affected by the construction.
  - 2. A video shall be taken of the post-construction conditions and their adjacent properties. Particular emphasis should be directed to roadway conditions as well as all right-of-way features that were affected by the construction.

- B. The Following shall be Included with the Video Documentation:
1. Coverage is required within and adjacent to the right-of-way, and easements, and storage, and staging areas where the work is being constructed.
  2. Documentation of the conditions of the adjacent properties or any affected structures as a result of the impending construction.
  3. Certification as to date work done and by whom.
  4. All videos shall be keyed to the construction drawings.
- C. Pre-Construction and Post-Construction on Videos shall be Submitted as Follows:
1. Pre-construction videos shall be presented to the Owner at the pre-construction conference.
  2. Post-construction videos shall be submitted prior to final project closeout. This submittal is contingent to final payment.

**END OF SECTION**



**SECTION 01 11 00  
SUMMARY OF WORK**

**PART 1      GENERAL**

1.01      WORK COVERED BY CONTRACT DOCUMENTS

The project consists of construction at Zero Duval, Key West, Florida. Project consists of the temporary removal of the existing wood dock, construction of a new tied back steel sheet pile wall with large outfall pipe, construction of new concrete cap, placement of flowable fill backfill, reinstallation of wood dock, repair of existing outfall pipe, tide valve installation and restoration of existing pavers.

**PART 2      PRODUCTS (NOT USED)**

**PART 3      EXECUTION (NOT USED)**

**END OF SECTION**



**SECTION 01 29 00  
PAYMENT PROCEDURES**

**PART 1 GENERAL**

1.01 SUBMITTALS

- A. Informational Submittals:
  - 1. Schedule of Values: Submit on Contractor's standard form.
  - 2. Schedule of Estimated Progress Payments:
    - a. Submit with initially acceptable Schedule of Values.
    - b. Submit adjustments thereto with Application for Payment.
  - 3. Application for Payment.
  - 4. Final Application for Payment.

1.02 ALLOWANCES

- A. Consult with Engineer in selection of products or services. Obtain proposals from Suppliers and offer recommendations.
- B. Allowances will be administered in accordance with Paragraph 11.02 of General Conditions.
- C. Submit, with application for payment, invoice showing date of purchase, from whom the purchase was made, the date of delivery of the product or service, and the price, including delivery to the Site and applicable taxes.

1.03 SCHEDULE OF VALUES

- A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.
- B. Upon request of Engineer, provide documentation to support the accuracy of the Schedule of Values.
- C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.
- D. Lump Sum Work:
  - 1. Reflect specified contingency allowances and alternates, as applicable.
  - 2. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, equipment testing, facility startup, and contract closeout separately.

- E. An unbalanced or front-end loaded schedule will not be acceptable.
- F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.

1.04 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

- A. Show estimated payment requests throughout Contract Times aggregating initial Contract Price.
- B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Contract Price as reflected by modifications to the Contract Documents.

1.05 APPLICATION FOR PAYMENT

- A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.
- B. Use detailed Application for Payment Form provided by Owner.
- C. Provide separate form for each schedule as applicable.
- D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.
- E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Engineer.
- F. Preparation:
  - 1. Round values to nearest dollar.
  - 2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Engineer.

1.06 PAYMENT

- A. Payment for all Lump Sum Work shown or specified in Contract Documents is included in the Contract Price. Payment will be based on a percentage complete basis for each line item of the accepted Schedule of Values.

**1.07 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS****A. Payment will not be made for following:**

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by Owner.
6. Material remaining on hand after completion of Work.

**1.08 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT**

- A. **Partial Payment:** No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings and preliminary operation and maintenance data is acceptable to Engineer.
- B. **Final Payment:** Will be made only for products incorporated in Work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

**PART 2 PRODUCTS (NOT USED)****PART 3 EXECUTION (NOT USED)****END OF SECTION**



**SECTION 01 31 19**  
**PROJECT MEETINGS**

**PART 1 GENERAL**

1.01 GENERAL

- A. Engineer will schedule physical arrangements for meetings throughout progress of Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

- A. Contractor shall be prepared to discuss the following subjects, as a minimum:

1. Required schedules (Preliminary Construction Schedule, Schedule of Values, Submittal).
2. Status of Bonds and insurance.
3. Sequencing of critical path work items.
4. Progress payment procedures.
5. Project changes and clarification procedures.
6. Use of site, access, office and storage areas, security and temporary facilities.
7. Major product delivery and priorities.
8. Contractor's safety plan and representative.
9. Preliminary Hurricane Evaluation Plan.

- B. Attendees will Include:

1. Owner.
2. Contractor's office representative.
3. Contractor's resident superintendent.
4. Contractor's quality control representative.
5. Subcontractors' representatives whom Contractor may desire or Engineer may request to attend.
6. Owner's representatives.
7. Others as appropriate.

1.03 PROGRESS MEETINGS

- A. Engineer will schedule regular progress meetings at Site, conducted monthly to review Work progress, progress schedule, Shop Drawing and Sample submissions schedule, Application for Payment, contract modifications, and other matters needing discussion and resolution.
- B. Attendees will Include:
  - 1. Owner's representative(s), as appropriate.
  - 2. Contractor, Subcontractors, and Suppliers, as appropriate.
  - 3. Engineer's representative(s).
  - 4. Others as appropriate.

1.04 QUALITY CONTROL AND COORDINATION MEETINGS

- A. Scheduled by Engineer on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of Work and work of other contractors.
- B. Attendees will Include:
  - 1. Contractor.
  - 2. Contractor's designated quality control representative.
  - 3. Subcontractors and Suppliers, as necessary.
  - 4. Owner's representatives.

1.05 PREINSTALLATION MEETINGS

- A. When required in individual Specification sections, convene at Site prior to commencing Work of that Section.
- B. Require attendance of entities directly affecting, or affected by, Work of that Section.
- C. Notify Engineer 4 days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

1.06 OTHER MEETINGS

- A. In accordance with Contract Documents and as may be required by Owner and Engineer.

**PART 2      PRODUCTS (NOT USED)**

**PART 3      EXECUTION (NOT USED)**

**END OF SECTION**

439197/WPB

PROJECT MEETINGS  
01 31 19 - 4

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 01 32 00  
PROGRESS SCHEDULES**

**PART 1 GENERAL**

1.01 SUBMITTALS

- A. Preliminary Progress Schedule: Submit within time specified in paragraph 2.05 of the General Conditions.
- B. Detailed Progress Schedule: Submit initial Detailed Progress Schedule within 30 days after Effective Date of the Agreement.
- C. Submit with Each Progress Schedule Submission:
  - 1. Contractor's certification that progress schedule submission is the actual schedule being utilized for execution of the Work.
  - 2. Progress Schedule: Four legible copies.
  - 3. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
- D. Prior to final payment, submit a final Updated Progress Schedule.

1.02 PRELIMINARY PROGRESS SCHEDULE

- A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 120 days, and a summary of balance of Project through Final Completion.
- B. Show activities including, but not limited to the following:
  - 1. Notice to Proceed.
  - 2. Permits.
  - 3. Submittals, with review time.
  - 4. Early procurement activities for long lead equipment and materials.
  - 5. Initial site work.
  - 6. Earthwork.
  - 7. Specified Work sequences and construction constraints.
  - 8. Contract Milestone and Completion Dates.
  - 9. Owner-furnished products delivery dates or ranges of dates.
  - 10. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
  - 11. System startup summary.
  - 12. Project close-out summary.
  - 13. Demobilization summary.

- C. Update Preliminary Progress Schedule monthly; as part of progress payment process. Failure to do so may cause Owner to withhold all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.
- D. Format: In accordance with Article Progress Schedule - Bar Chart.
- E. Detailed progress schedule.
- F. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.
- G. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.
- H. When accepted by Engineer, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- I. Update monthly to reflect actual progress and occurrences to date, including weather delays.

#### 1.03 PROGRESS SCHEDULE - BAR CHART

- A. General: Comprehensive bar chart schedule, generally as outlined in Associated General Contractors of America (AGC) Publication No. 1107.1, "Construction Planning and Scheduling, latest edition. If a conflict occurs between the AGC publication and this specification, this specification shall govern.
- B. Format:
  - 1. Unless otherwise approved, white paper, 11-inch by 17-inch sheet size.
  - 2. Title Block: Show name of project and Owner, date submitted, revision or update number, and name of scheduler.
  - 3. Identify horizontally, across the top of the schedule, the time frame by year, month, and day.
  - 4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
  - 5. Legend: Describe standard and special symbols used.
- C. Contents: Identify, in chronological order, those activities reasonably required to complete the Work, including as applicable, but not limited to:
  - 1. Obtaining permits, submittals for early product procurement and long lead time items.

2. Mobilization and other preliminary activities.
3. Initial site work.
4. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
5. Major equipment design, fabrication, factory testing, and delivery dates.
6. Sitework.
7. Concrete Work.
8. Structural steel Work.
9. Architectural features Work.
10. Conveying systems Work.
11. Equipment Work.
12. Mechanical Work.
13. Electrical Work.
14. Instrumentation and control Work.
15. Interfaces with Owner-furnished equipment.
16. Other important Work for each major facility.
17. Equipment and system startup and test activities.
18. Project closeout and cleanup.
19. Demobilization.

#### 1.04 PROGRESS OF THE WORK

- A. Updated Progress Schedule shall Reflect:
  1. Progress of Work to within 5 working days prior to submission.
  2. Approved changes in Work scope and activities modified since submission.
  3. Delays in Submittals or resubmittals, deliveries, or Work.
  4. Adjusted or modified sequences of Work.
  5. Other identifiable changes.
  6. Revised projections of progress and completion.
  7. Report of changed logic.
- B. Produce detailed subschedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as facility shutdowns, etc.
- C. If Contractor fails to complete activity by its latest scheduled completion date and this failure is anticipated to extend Contract Times (or Milestones), Contractor shall, within 7 days of such failure, submit a written statement as to how Contractor intends to correct nonperformance and return to acceptable current progress schedule. Actions by Contractor to complete Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

- D. Owner may order Contractor to increase plant, equipment, labor force or working hours if Contractor fails to:
  - 1. Complete a Milestone activity by its completion date.
  - 2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

#### 1.05 NARRATIVE PROGRESS REPORT

- A. Format:
  - 1. Organize same as Progress Schedule.
  - 2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.
- B. Contents:
  - 1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks, etc.).
  - 2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
  - 3. Contractor's plan for management of site (e.g., lay down and staging areas, construction traffic, etc.), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
  - 4. Identification of new activities and sequences as a result of executed Contract changes.
  - 5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
  - 6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
  - 7. Changes to activity logic.
  - 8. Changes to the critical path.
  - 9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
  - 10. Steps taken to recover the schedule from Contractor-caused delays.

#### 1.06 SCHEDULE ACCEPTANCE

- A. Engineer's acceptance will demonstrate agreement that the proposed schedule conforms with requirements of Contract including, but not limited to, the following:
  - 1. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
  - 2. Specified Work sequences and constraints are shown as specified.

3. Complete Scope of Work is included.
4. Specified Owner furnished Equipment or Material arrival dates, or range of dates, are included.
5. Access restrictions are accurately reflected.
6. Start-up and testing times are as specified.
7. Training time is as specified.
8. Level of detail is as specified herein.
9. Submittal submission and review times are as specified.
10. Duration of activities are reasonable.
11. Sequencing is reasonable and does not include preferential logic contrary to the contingency/float sharing clauses of this Specification.
12. Meets all administrative requirements of Contract Documents.
13. Updated schedules reflect actual dates and duration of Work performed.

B. Preliminary Progress Schedule Review Disposition:

1. Accepted.
2. Rejected as Noted:
  - a. Make requested corrections; resubmit within 10 days.
  - b. Until acceptable to Engineer as the Baseline Progress Schedule, continue the review and revision process, during which time Contractor shall update the schedule on a monthly basis to reflect actual progress and occurrences to date.

C. Detailed Progress Schedule:

1. Accepted.
2. Rejected as Noted:
  - a. Make requested corrections; resubmit within 10 days.
  - b. Until acceptable to Engineer as the Baseline Progress Schedule, continue the review and revision process.

D. Narrative Report: All changes to activity duration and sequences, including the addition or deletion of activities subsequent to Engineer's acceptance of the Baseline Progress Schedule, shall be delineated in the Narrative Report current with the proposed Updated Progress Schedule.

## 1.07 ADJUSTMENT OF CONTRACT TIMES

- A. Reference General Conditions.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.

C. Schedule Contingency:

1. Contingency, when used in the context of the Progress Schedule, is time between Contractor's proposed Completion Time and Contract Completion Time.
2. Contingency included in Progress Schedule is a Project resource available to both Contractor and Owner to meet Contract Milestones and Contract Times. Use of Schedule contingency shall be shared to the proportionate benefit of both parties.
3. Use of schedule contingency suppression techniques such as preferential sequencing and extended activity times are prohibited.
4. Pursuant to Contingency sharing provisions of this Specification, no time extensions will be granted, nor will delay damages be paid until a delay occurs which (i) consumes all available contingency time, and (ii) extends Work beyond the Contract Completion date.

D. Claims Based on Contract Times:

1. Where Engineer has not yet rendered formal decision on Contractor's claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in progress schedule, Contractor shall reflect an interim adjustment in the progress schedule as acceptable to Engineer.
2. It is understood and agreed that such interim acceptance will not be binding on either Contractor or Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
3. Contractor shall revise progress schedule prepared thereafter in accordance with Engineer's formal decision.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 33 00**  
**SUBMITTALS**

**PART 1 GENERAL**

1.01 GENERAL

- A. Inquiries: Direct to Engineer regarding procedure, purpose, or extent of Submittal.
- B. Timeliness: Schedule and make submissions in accordance with requirements of individual Specification sections and in such sequence as to cause no delay in Work or in work of other contractors.
- C. Identification of Submittals:
  - 1. Complete, sign, and transmit with each Submittal package, one Transmittal of Contractor's Submittal Form attached at end of this Section.
  - 2. Identify each Submittal with the following numbering and tracking system:
    - a. Sequentially number each Submittal.
    - b. Resubmission of a Submittal will have original number with sequential alphabetic suffix.
  - 3. Format: Orderly, indexed with labeled tab dividers.
  - 4. Show date of submission.
  - 5. Show Project title and Owner's contract identification and contract number.
  - 6. Show names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
  - 7. Identify, as applicable, Contract Document section and paragraph to which Submittal applies.
  - 8. Identify Submittal type; submit only one type in each Submittal package.
  - 9. Identify and indicate each deviation or variation from Contract Documents.
- D. Resubmissions: Clearly identify each correction or change made.
- E. Incomplete Submittal Submissions:
  - 1. Engineer will return entire Submittal for Contractor's revision/correction and resubmission.
  - 2. Submittals which do not clearly bear Contractor's specific written indication of Contractor review and approval of Submittal or which are transmitted with an unsigned or uncertified submission form or as may otherwise be required will be returned to Contractor unreviewed.

- F. Nonspecified Submissions: Submissions not required under these Contract Documents and not shown on submissions will not be reviewed and will be returned to Contractor.
- G. Engineer's Review: Engineer will act upon Contractor's Submittal and transmit response to Contractor not later than 20 working days after receipt, unless otherwise specified. Resubmittals will be subject to same review time.
- H. Schedule Delays:
  - 1. No adjustment of Contract Times or Price will be allowed due to Engineer's review of Submittals, unless all of the following criteria are met:
    - a. Contractor has notified Engineer in writing that timely review of Submittal in question is critical to progress of Work, and has received Engineer's written acceptance to reflect such on current accepted submissions and progress schedule. Written agreement by the Engineer to reduce Submittal review time will be made only for unusual and Contractor-justified reasons. Acceptance of a progress schedule containing Submittal review times less than specified or less than agreed to in writing by Engineer will not constitute Engineer's acceptance of review times.
    - b. Engineer has failed to review and return first submission of a Submittal within agreed time indicated on current accepted schedule of submissions or, if no time is indicated thereon, within 30 days after receipt.
    - c. Contractor demonstrates that delay in progress of Work is directly attributable to Engineer's failure to return Submittal within time indicated and accepted by Engineer.
  - 2. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmission of Submittals, including multiple resubmissions.

## 1.02 SHOP DRAWINGS AND SAMPLES

- A. Copies:
  - 1. Shop Drawings and Product Data: Submit four copies, plus whatever the Contractor requires to be returned, maximum eight.
  - 2. Samples: Two, unless otherwise specified in individual Specification sections.
- B. General: Submit to Engineer as required by individual Specification sections.

- C. Identify and Indicate:
1. Pertinent Drawing sheet(s) and detail number(s), products, units and assemblies, and system or equipment identification or tag numbers.
  2. Critical field dimensions and relationships to other critical features of Work.
  3. Samples: Source, location, date taken, and by whom.
  4. Each deviation or variation from Contract Documents.
  5. Proper storage and maintenance requirements.
- D. Design Data: When specified, provide Project-specific information as required and as necessary to clearly show calculations, dimensions, logic and assumptions, and referenced standards and codes upon which design is based.
- E. Foreign Manufacturers: When proposed, include following additional information:
1. Names and addresses of at least two companies closest to Project that maintain technical service representatives.
  2. Complete inventory of spare parts and accessories for each piece of equipment.
- F. Preparation:
1. Format: Whenever possible, schedule for and combine Shop Drawings and Samples required for submission in each Specification section or division into a single Submittal package. Also combine product data for like items into a single Submittal package.
  2. Present in a clear and thorough manner and of sufficient detail to show kind, size, arrangement, and function of components, materials, and devices and compliance with Contract Documents. Identify details by reference to sheet and detail, and schedule or room numbers shown on Drawings.
  3. Reproducible Copy:
    - a. Preferred Minimum Sheet Size: 8-1/2- by 11-inch and 11- by 17-inch pages, suitable for photocopying.
    - b. Larger than 11- by 17-Inch Sheets: 22-inch by 34-inch preferred, mylar or sepias suitable for copying in a blueprint machine.
  4. Piping Systems: Drawn to scale.
  5. Product Data: Clearly mark each copy to identify pertinent products or models and show performance characteristics and capacities, dimensions and clearances required, wiring or piping diagrams and controls, and external connections, anchorage, and supports required.

6. Equipment and Component Titles: Identical to title shown on Drawings.
  7. Manufacturer's Standard Schematic Drawings and Diagrams as Follows:
    - a. Modify to delete information that is not applicable to Work.
    - b. Supplement standard information to provide information specifically applicable to Work.
- G. Shop Drawing Disposition: Engineer will review, mark, and stamp as appropriate and distribute marked-up copies as noted:
1. Conforms w/Concept (for Incorporation in Work):
    - a. Two copies furnished Owner.
    - b. One copy furnished Resident Project Representative.
    - c. One copy retained in Engineer's file.
    - d. Remaining copies returned to Contractor appropriately annotated.
    - e. Contractor may begin to implement activities to incorporate specific product(s) or Work covered by Submittal.
  2. Conforms w/Concept – Except As Noted (for Incorporation in Work):
    - a. Two copies furnished Owner.
    - b. One copy furnished Resident Project Representative.
    - c. One copy retained in Engineer's file.
    - d. Remaining copies returned to Contractor appropriately annotated.
    - e. Contractor may begin to implement activities to incorporate product(s) or Work covered by Submittal, in accordance with Engineer's notations.
  3. Not Accepted:
    - a. One copy furnished Resident Project Representative.
    - b. One copy retained in Engineer's file.
    - c. Remaining copies returned to Contractor appropriately annotated.
    - d. Contractor shall make corrections or develop replacement and resubmit (in same manner and quantity as specified for original submission).
    - e. Submittal is not approved.
  4. Revise and Resubmit:
    - a. One copy furnished Resident Project Representative.
    - b. One copy retained in Engineer's file.
    - c. Remaining copies returned to Contractor appropriately annotated.
    - d. Contractor shall complete and resubmit or submit missing portions.
    - e. Submittal is not approved.
- H. Sample Disposition: Same as Shop Drawing disposition; samples will not be returned.

## 1.03 ADMINISTRATIVE SUBMITTALS

- A. Copies: Submit four.
- B. Description: Submittals that are not Shop Drawings or Samples, or that do not reflect quality of product or method of construction. May include, but not limited to those Submittals identified below.
- C. Applications for Payment (and Cash Allowance Data and Values): Meet requirements of Section 01 29 00, Payment Procedures.
- D. Progress Reports and Quantity Charts: As may be required in Section 01 32 00, Progress Schedules.
- E. Hurricane Evaluation Plan: The Contractor shall prepare the Engineer with a written plan and schedule describing how and when the Contractor will remove all unnecessary items from the work area and tie down all remaining supplies and barricades in the event that a hurricane warning is issued, identifying gussets in particular. If a warning is issued, the Contractor shall remove all unnecessary items from the work area(s) and will tie down all movable (under 200 pounds) objects. The Owner shall not be liable for any financial hardship or delays caused as a result of demobilization or remobilization due to the above.
- F. Schedules:
  - 1. Progress Schedule(s): Meet the requirements of Section 01 32 00, Progress Schedules.
  - 2. Schedule of Values: Meet requirements of Section 01 29 00, Payment Procedures.
  - 3. Schedule of Submittal Submissions:
    - a. Prepare and submit, preliminary list of submissions grouped by Contract Document article/paragraph number or Specification section number, with identification, numbering and tracking system as specified under Paragraph Identification of Submittals and as approved by Engineer.
    - b. Include Only the Following Required Submissions:
      - 1) Shop Drawings and Samples.
      - 2) Training plans.
      - 3) Test procedures.
      - 4) Operation and maintenance manuals.
      - 5) Record documents.
      - 6) Specifically required certificates, warranties, and service agreements.

- c. Coordinate with progress schedule and prepare submissions to show for each Submittal, at a minimum, the following:
  - 1) Estimated submission date to Engineer.
  - 2) Specifically requested and clearly identified Engineer review time if shorter than that set forth herein, with justification for such request and critical dates Submittals will be needed from Engineer.
  - 3) For first 6-month period from the date the Contract Times commence or following any update or adjustment of the submissions, the estimated submission date shall be week, month, and year; for submissions beyond 6-month time period, show closest month and year.
- d. Submit to Engineer Monthly:
  - 1) Updated list if changes have occurred. Otherwise, submit a written communication confirming existing list.
  - 2) Adjusted submissions reflecting submission activity planned for forthcoming 6-month time period and beyond. Coordinate with progress schedule updates.

G. Submittals Required by Laws, Regulations, and Governing Agencies:

- 1. Submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
- 2. Transmit to Engineer for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

H. Disposition: Engineer will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:

- 1. Accepted:
  - a. Acceptance will indicate that Submittal conforms to intent of Contract Documents as to form and substance.
  - b. Contractor may proceed to perform Submittal related Work.
  - c. One copy furnished Owner.
  - d. One copy furnished Resident Project Representative.
  - e. One copy retained in Engineer's file.
  - f. Remaining copies returned to Contractor appropriately annotated.
- 2. Rejected as Noted:
  - a. One copy retained in Engineer's file.
  - b. Remaining copies returned to Contractor appropriately annotated.
  - c. Contractor shall revise/correct or develop replacement and resubmit.

## 1.04 QUALITY CONTROL SUBMITTALS

- A. Certificates: Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in the individual Specification sections.
- B. Statements of Qualification: Evidence of qualification, certification, or registration. As required in these Contract Documents to verify qualifications of professional land surveyors, engineers, materials testing laboratories, specialty Subcontractors, trades, specialists, consultants, installers, and other professionals. Reference paragraph 1.01.A.51 of Supplementary Conditions for the definition of Specialist.
- C. Field Samples: Provide as required by individual Specifications and as may be required by Engineer during progress of Work.
- D. Written Test Reports of Each Test and Inspection: As a minimum, include the following:
  - 1. Date of test and date issued, Project title and number, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
  - 2. Date and time of sampling or inspection and record of temperature and weather conditions.
  - 3. Identification of product and Specification section, location of Sample, test or inspection in the Project, type of inspection or test with referenced standard or code, certified results of test.
  - 4. Compliance with Contract Documents, and identifying corrective action necessary to bring materials and equipment into compliance.
  - 5. Provide an interpretation of test results, when requested by Engineer.
- E. Disposition: Engineer will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:
  - 1. Accepted:
    - a. Acceptance will indicate that Submittal conforms to intent of Contract Documents as to form and substance.
    - b. Contractor may proceed to perform Submittal related Work.
    - c. One copy furnished Owner.
    - d. One copy furnished Resident Project Representative.
    - e. One copy retained in Engineer's file.
    - f. Remaining copies returned to Contractor appropriately annotated.

2. Rejected as Noted:
  - a. One copy retained in Engineer's file.
  - b. Remaining copies returned to Contractor appropriately annotated.
  - c. Contractor shall revise/correct or develop replacement and resubmit.

#### 1.05 CONTRACT CLOSEOUT SUBMITTALS

- A. General: In accordance with Section 01 77 00, Contract Closeout.
- B. Disposition: Engineer will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:
  1. Accepted:
    - a. Acceptance will indicate that Submittal conforms to intent of Contract Documents as to form and substance.
    - b. Contractor may proceed to perform Submittal related Work.
    - c. One copy furnished Owner.
    - d. One copy furnished Resident Project Representative.
    - e. One copy retained in Engineer's file.
    - f. Remaining copies returned to Contractor appropriately annotated.
  2. Rejected as Noted:
    - a. One copy retained in Engineer's file.
    - b. Remaining copies returned to Contractor appropriately annotated.
    - c. Contractor shall revise/correct or develop replacement and resubmit.

#### 1.06 SUPPLEMENTS

- A. The supplement listed below, following "END OF SECTION," is part of this Specification.
  1. Transmittal of Contractor's Submittal.

#### **PART 2 PRODUCTS (NOT USED)**

#### **PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**CH2M HILL**

**TRANSMITTAL OF CONTRACTOR'S SUBMITTAL**  
(ATTACH TO EACH SUBMITTAL)

DATE: \_\_\_\_\_

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Submittal No.: \_\_\_\_\_  
 New Submittal  Resubmittal  
Previous Submittal No.: \_\_\_\_\_  
Project: \_\_\_\_\_  
Project No.: \_\_\_\_\_  
Specification Section No.: \_\_\_\_\_

FROM: \_\_\_\_\_  
Contractor

**(Cover only one section with each transmittal)**  
Schedule Date of Submittal: \_\_\_\_\_

**SUBMITTAL TYPE:**     Shop Drawing                       Administrative                       Sample  
                                  Quality Control                       Contract Closeout                       "Or-Equal"/Substitute

**The following items are hereby submitted:**

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: \_\_\_\_\_  
Contractor (Authorized Signature)

439197/WPB

SUBMITTALS  
01 33 00 - 2

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 01 42 13**  
**ABBREVIATIONS**

**PART 1      GENERAL**

- 1.01      REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES
- A.      Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith shall be as provided in paragraph 3.02 of the General Conditions, and as may otherwise be required herein and in the individual Specification sections.
  - B.      Work specified by reference to the published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet the requirements or surpass the minimum standards of quality for materials and workmanship established by the designated standard or specification.
  - C.      Where so specified, products or workmanship shall also meet or exceed the additional prescriptive or performance requirements included within the Contract Documents to establish a higher or more stringent standard of quality than that required by the referenced standard.
  - D.      Where two or more standards are specified to establish quality, the product and workmanship shall meet or exceed the requirements of the most stringent.
  - E.      Where both a standard and a brand name are specified for a product in the Contract Documents, the proprietary product named shall meet or exceed the requirements of the specified reference standard.
  - F.      Copies of Standards and Specifications of Technical Societies:
    - 1.      Copies of applicable referenced standards have not been bound in these Contract Documents.
    - 2.      Where copies of standards are needed by the Contractor, obtain a copy or copies directly from the publication source and maintain in an orderly manner at the site as Work site records, available to the Contractor's personnel, Subcontractors, Owner, and Engineer.

## 1.02 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

1. AA Aluminum Association
2. AABC Associated Air Balance Council
3. AAMA American Architectural Manufacturers Association
4. AASHTO American Association of State Highway and Transportation Officials
5. ACI American Concrete Institute
6. AFBMA Anti-Friction Bearing Manufacturers' Association
7. AGA American Gas Association
8. AGMA American Gear Manufacturers' Association
9. AI Asphalt Institute
10. AISC American Institute of Steel Construction
11. AISI American Iron and Steel Institute
12. AITC American Institute of Timber Construction
13. ALS American Lumber Standards
14. AMA Acoustical Materials Association
15. AMCA Air Movement and Control Association
16. ANSI American National Standards Institute
17. APA American Plywood Association
18. API American Petroleum Institute
19. APWA American Public Works Association
20. AREA American Railway Engineering Association
21. ARI Air Conditioning and Refrigeration Institute
22. ASA American Standards Association
23. ASAE American Society of Agricultural Engineers
24. ASCE American Society of Civil Engineers
25. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
26. ASNT American Society for Nondestructive Testing
27. ASME American Society of Mechanical Engineers
28. ASTM American Society for Testing and Materials
29. AWI Architectural Wood Work Institute
30. AWPA American Wood Preservers' Association
31. AWPB American Wood Preservers Bureau
32. AWPI American Wood Preservers' Institute
33. AWS American Welding Society
34. AWWA American Water Works Association
35. BHMA Builders Hardware Manufacturers' Association

36.	CBMA	Certified Ballast Manufacturers' Association
37.	CDA	Copper Development Association
38.	CGA	Compressed Gas Association
39.	CIPRI	Cast Iron Pipe Research Institute
40.	CISPI	Cast Iron Soil Pipe Institute
41.	CMAA	Crane Manufacturers' Association of America
42.	CRSI	Concrete Reinforcing Steel Institute
43.	CS	Commercial Standard
44.	CSA	Canadian Standards Association
45.	CSI	Construction Specifications Institute
46.	CTSS	Caltrans Standard Specification
47.	EJCDC	Engineers Joint Contract Documents' Committee
48.	ETL	Engineering Test Laboratories
49.	FCC	Federal Communications Commission
50.	FAA	Federal Aviation Administration
51.	FEMA	Federal Emergency Management Agency
52.	FGMA	Flat Glass Marketing Association
53.	FM	Factory Mutual
54.	Fed. Spec.	Federal Specifications
55.	FS	Federal Specification
56.	GA	Gypsum Association
57.	HI	Hydraulic Institute
58.	HMI	Hoist Manufacturers' Institute
59.	ICBO	International Conference of Building Officials
60.	ICEA	Insulated Cable Engineers' Association
61.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
62.	IES	Illuminating Engineering Society
63.	IFI	Industrial Fasteners Institute
64.	ISA	Instrument Society of America
65.	ISO	Insurance Service Office
66.	JIC	Joint Industry Conferences of Hydraulic Manufacturers
67.	MIA	Marble Institute of America
68.	Mil. Sp.	Military Specification or MIL
69.	MS	Military Specifications
70.	MMA	Monorail Manufacturers' Association
71.	NAAMM	National Association of Architectural Metal Manufacturers
72.	NACE	National Association of Corrosion Engineers
73.	NBHA	National Builders' Hardware Association
74.	NEBB	National Environmental Balancing Bureau
75.	NEC	National Electrical Code
76.	NECA	National Electrical Contractor's Association
77.	NEMA	National Electrical Manufacturers' Association

78.	NESC	National Electric Safety Code
79.	NFPA	National Fire Protection Association
80.	NHLA	National Hardwood Lumber Association
81.	NHPMA	Northern Hardwood and Pine Manufacturer's Association
82.	NLMA	National Lumber Manufacturers' Association
83.	NRCA	National Roofing Contractors Association
84.	NSF	National Sanitation Foundation Testing Laboratory
85.	NSPE	National Society of Professional Engineers
86.	NTMA	National Terrazzo and Mosaic Association
87.	NWWDA	National Wood Window and Door Association
88.	OECI	Overhead Electrical Crane Institute
89.	OSHA	Occupational Safety and Health Act (both Federal and State)
90.	PCI	Prestressed Concrete Institute
91.	PEI	Porcelain Enamel Institute
92.	PPI	Plastic Pipe Institute
93.	PS	Product Standards Section-U.S. Department of Commerce
94.	RMA	Rubber Manufacturers' Association
95.	SAE	Society of Automotive Engineers
96.	SCPRF	Structural Clay Products Research Foundation
97.	SDI	Steel Deck Institute
98.	SDI	Steel Door Institute
99.	SIGMA	Sealed Insulating Glass Manufacturing Association
100.	SJI	Steel Joist Institute
101.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
102.	SPI	Society of the Plastics Industry
103.	SSPC	Steel Structures Painting Council
104.	SWI	Steel Window Institute
105.	TEMA	Tubular Exchanger Manufacturers' Association
106.	TCA	Tile Council of America
107.	UBC	Uniform Building Code
108.	UFC	Uniform Fire Code
109.	UL	Underwriters Laboratories Inc.
110.	UMC	Uniform Mechanical Code
111.	US	U.S. Bureau of Standards
112.	USBR	U.S. Bureau of Reclamation
113.	WCLIB	West Coast Lumber Inspection Bureau
114.	WWPA	Western Wood Products Association

**PART 2 PRODUCTS (NOT USED)****PART 3 EXECUTION (NOT USED)****END OF SECTION**

**SECTION 01 50 00**  
**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1 GENERAL**

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
1. American Association of Nurserymen: American Standards for Nursery Stock.
  2. U.S. Weather Bureau, "Rainfall-Frequency Atlas of the U.S. for Durations From 30 Minutes to 24 Hours and Return Periods From 1 to 100 Years."
  3. U.S. Department of Agriculture, "Urban Hydrology for Small Watersheds."
  4. Federal Emergency Management Agency.
  5. NFPA, National Fire Prevention Standard for Safeguarding Building Construction Operations.

1.02 SUBMITTALS

- A. Administrative Submittals: Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
- B. Shop Drawings:
1. Temporary Utility Submittals:
    - a. Electric power supply and distribution plans.
    - b. Drainage plans.
  2. Temporary Construction Submittals:
    - a. Parking area plans.
    - b. Contractor's field office, storage yard, and storage building plans, including gravel surfaced area.
    - c. Fencing and protective barrier locations and details.
    - d. Staging area location plan.
    - e. Traffic Control and Routing Plans: As specified herein, and proposed revisions thereto.
    - f. Plan for maintenance of existing plant operations.
  3. Temporary Control Submittals: Noise control plan.

1.03 MOBILIZATION

- A. Mobilization shall Include, but Not be Limited to, these Principal Items:
  - 1. Obtaining required permits.
  - 2. Installing temporary construction power, wiring, and lighting facilities.
  - 3. Providing onsite communication facilities, including telephones.
  - 4. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
  - 5. Arranging for and erection of Contractor's work and storage yard.
  - 6. Posting OSHA required notices and establishing safety programs and procedures.
  - 7. Having Contractor's superintendent at site full time.
- B. Areas designated for Contractor's temporary facilities shall be coordinated with Engineer and City.

**PART 2 PRODUCTS**

**PART 3 EXECUTION**

3.01 TEMPORARY UTILITIES

- A. Fire Protection: Furnish and maintain on site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).
- B. Cooling and Ventilating:
  - 1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials, equipment, and finishes from damage due to temperature or humidity.
  - 2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
  - 3. Pay all costs of installation, maintenance, operation, removal, and fuel consumed.

3.02 TEMPORARY ELECTRIC POWER

- A. The Contractor shall make arrangements to obtain and pay for electrical power used until final acceptance by the Owner.

### 3.03 SAFETY REQUIREMENTS FOR TEMPORARY ELECTRIC POWER

- A. Temporary electric power installation shall meet the construction safety requirements of OSHA, state and other governing agencies.

### 3.04 TEMPORARY WATER

- A. The Contractor shall make his own arrangements to obtain suitable water and shall pay all costs.

### 3.05 SANITARY FACILITIES

- A. The Contractor shall provide and maintain sanitary facilities for his employees and his subcontractors that will comply with the regulations of the local and state departments of health and as directed by the Engineer.

### 3.06 PROTECTION OF WORK AND PROPERTY

#### A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along the line of work, unless other arrangements satisfactory to owners of said utilities have been made.
3. Where completion of Work requires temporary or permanent removal and/or relocation of an existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
4. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where Contractor's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer, or irrigation system and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by Contractor.
7. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance.
  - a. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.

8. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
  9. Maintain original site drainage wherever possible.
- B. Site Security: Reference the General Conditions.
- C. Barricades and Lights:
1. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work.
  2. Provide to protect existing facilities and adjacent properties from potential damage.
  3. Locate to enable access by facility operators and property owners.
  4. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.
  5. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section.
- D. Existing Structures: Where Contractor contemplates removal of small structures such as mailboxes, signposts, and culverts that interfere with Contractor's operations, obtain approval of property owner and Engineer. Replace those removed in a condition equal to or better than original.
- E. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

### 3.07 TEMPORARY CONTROLS

- A. Air Pollution Control:
1. Minimize air pollution from construction operations.
  2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
  3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
  4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board,

plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as the need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Ordinance: City of Key West.
3. Noise Control Plans: Proposed plan to mitigate construction noise impacts and to comply with noise control ordinances including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to an existing waterway.
2. Prior to commencing excavation and construction, obtain Owner's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect Work and existing facilities from flooding during construction period.

3.08 ROADS

- A. Maintain access to all roads. Do not block any roadways during construction. If road blockage is anticipated, Contractor shall receive approval from City prior to starting construction.
- B. Maintain drainage ways. Install and maintain culverts to allow water to flow. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.
- C. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.
- D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.

3.09 PARKING AREAS

- A. Parking cars on individual work sites shall be kept to a minimum. A parking plan shall be required for the Site.
- B. Control Vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations. No parking along roadways shall be allowed.

3.10 CLEANING DURING CONSTRUCTION

- A. In accordance with General Conditions, as may be specified in Specification sections, and as required herein.
- B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep all floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up all debris and dispose.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.
- D. At least weekly, brush sweep the entry drive and roadways, and all other streets and walkways affected by Work and where adjacent to Work.

**END OF SECTION**



**SECTION 01 77 00  
CONTRACT CLOSEOUT**

**PART 1 GENERAL**

1.01 SUBMITTALS

- A. Quality Control Submittals: Written procedures for maintaining and markup of record documents.
- B. Contract Closeout Submittals: Submit prior to application for final payment.
  - 1. Record Documents: As required in the General Conditions.
  - 2. Approved Shop Drawings and Samples: As required in the General Conditions.
  - 3. Consent of Surety to Final Payment: As required in the General Conditions.
  - 4. Releases or Waivers of Liens and Claims: As required in the General Conditions.
  - 5. Releases from Agreements.
  - 6. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01 29 00, Payment Procedures.
  - 7. Spare Parts and Special Tools: As required by individual Specification sections.

1.02 RECORD DOCUMENTS

- A. Quality Assurance:
  - 1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
  - 2. Accuracy of Records:
    - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
    - b. Purpose of Project record documents is to document factual information regarding aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.
  - 3. Make entries within 24 hours after receipt of information that a change in Work has occurred.

4. Prior to submitting each request for progress payment, request Engineer's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Engineer to recommend the whole or any part of the Contractor's Application for Payment, either partial or final.
5. Contractor to have a licensed surveyor provide signed and sealed drawing that include the following as an attachment to the Project Record Drawings.
  - a. All pipe inverts elevations, bottom of structures elevation, pipe grade, LF of new pipe installed;
  - b. All rim elevations. All grate elevations.
  - c. Locations of Catch basins, Well structures, and Manholes.
  - d. Limits of construction.
  - e. Replace existing property pins removed for construction.
  - f. Submit record drawings (four) signed and sealed. Provide to the city three DISCS with electronic copies in AUTOCAD and PDF.

#### 1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event Contractor is unable to secure written releases, inform the Owner of the reasons:
  1. Owner or its representatives will examine the site, and Owner will direct Contractor to complete Work that may be necessary to satisfy terms of the easement.
  2. Should Contractor refuse to perform this Work, Owner reserves the right to have it done by separate contract and deduct the cost of same from the Contract Price, or require the Contractor to furnish a satisfactory Bond in a sum to cover legal claims for damages.
  3. When Owner is satisfied that Work has been completed in agreement with the Contract Documents and terms of easements, the right is reserved to waive the requirement for written release if: (i) Contractor's failure to obtain such statement is due to the grantor's refusal to sign, and this refusal is not based upon any legitimate claims that Contractor has failed to fulfill the terms of the easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting the grantor.

**PART 2 PRODUCTS (NOT USED)****PART 3 EXECUTION**

## 3.01 MAINTENANCE OF RECORD DOCUMENTS

## A. General:

1. Promptly following commencement of Contract Times, secure from Engineer at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
2. Delete Engineer title block and seal from all documents.
3. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
4. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

## B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by Engineer.

## C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
  - a. Color Coding:
    - 1) Green when showing information deleted from Drawings.
    - 2) Red when showing information added to Drawings.
    - 3) Blue and circled in blue to show notes.
  2. Date entries.
  3. Call attention to entry by "cloud" drawn around area or areas affected.
  4. Legibly mark to record actual changes made during construction, including, but not limited to:
    - a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
    - b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.

- c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
  - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
  - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
- a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
  - b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
  - c. Make identification so descriptive that it may be related reliably to Specifications.

### 3.02 FINAL CLEANING

- A. At completion of Work at each Site or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire site or parts thereof, as applicable.
  - 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Engineer.
  - 2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
  - 3. Repair, patch, and touchup marred surfaces to specified finish and match adjacent surfaces.
  - 4. Broom clean exterior paved driveways and parking areas.
  - 5. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
  - 6. Rake clean all other surfaces.
  - 7. Leave water courses, gutters, and ditches open and clean.
- B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

**END OF SECTION**

**SECTION 02 41 00**  
**DEMOLITION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Demolition and removal of existing buildings, structures, dock structures and bulkheads.
- B. Demolition and removal of site improvements adjacent to a building or structure to be demolished and rubble riprap.
- C. Removing belowgrade construction.
- D. Disconnecting, capping or sealing, and removing site utilities.

1.02 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them offsite unless indicated to be removed and salvaged or recycled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.03 SUBMITTALS

- A. Proposed Environmental-Protection, and Dust-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate. Contractor shall reference the provided asbestos surveys where necessary for permit, proper disposal, and pricing.
- B. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Locations of temporary protection and means of egress, including for other tenants affected by building demolition operations.
  - 5. Coordination of Owner's continuing occupancy of adjacent buildings and partial use of premises.

- 6. Phase Demolition as indicated on Drawings.
- C. Inventory: After building demolition is complete, submit a list of items that have been removed and salvaged.
- D. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations. Submit before Work begins.

#### 1.04 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with local regulations.
- D. Predemolition Conference: Conduct conference at Project site. Review methods and procedures related to building demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be demolished.
  - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review and finalize protection requirements.

#### 1.05 PROJECT CONDITIONS

- A. Buildings and marine structures to be demolished will be vacated and their use discontinued before start of Work of each respective Phase. Buildings will contain furniture, boxes, files, loose objects, and other miscellaneous items that will be removed by the Owner. These elements shall not be removed and disposed of offsite as part of this Contract by the Contractor.
- B. Owner assumes no responsibility for buildings and structures to be demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical. All materials shall be removed and legally disposed of by Contractor.

- C. Underwater materials and debris are known to be present within the project limits. Contractor shall remove all tires, vehicles, cables, vegetation, sunken boats and any other debris from the sea bed/floor prior to any fill operations.

#### 1.06 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's and tenants adjacent site operations.

### **PART 2 PRODUCTS (NOT USED)**

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required. Unless noted otherwise, all materials shall be removed and legally disposed of offsite by the Contractor.
- B. Inventory and record the condition of items to be removed and salvaged.
- C. Contractors shall inspect the entire site and determine the extent of work. Contractors shall be responsible for removal of materials and items in their entirety.

#### 3.02 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  1. Arrange to shut off indicated utilities with utility companies.
  2. If utility services are required to be removed, relocated, or abandoned, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- B. Existing Utilities: Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing. All utility disconnects are the Contractor's responsibility. Owner will provide support where possible.
- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished. Strengthen or add new supports when required during progress of demolition.

D. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Store items in a secure area until delivery to Owner.

3.03 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities not designated to be demolished.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during demolition and cleaned and reinstalled in their original locations after demolition operations are complete.
- C. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.
1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.
1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  2. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
- E. Control dust at site and avoid impacting adjacent areas, interior and exterior, as a result of dust from construction.

3.04 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings, dock structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  2. Maintain adequate ventilation when using cutting torches.
  3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: Perform surveys as the Work progresses to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with docks, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
  2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

### 3.05 MECHANICAL DEMOLITION

- A. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven saw, then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade and Asphaltic Concrete Pavement: Saw-cut perimeter of area to be demolished at junctures with construction indicated to remain, then break up and remove.
- C. Below Grade Construction: Demolish foundation walls and other below grade construction and legally dispose of offsite.
- D. Existing Utilities: Demolish and remove existing utilities and below grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
  2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.06 SITE RESTORATION

- A. Below grade Areas: Completely fill below grade areas and voids resulting from building demolition operations with satisfactory soil materials and pavement.

3.07 REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.
  - 1. Do not allow demolished materials to accumulate onsite.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.09 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

**END OF SECTION**

**SECTION 03 10 00  
CONCRETE FORMWORK**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section includes formwork for structural concrete and related accessories.

1.02 REFERENCES

- A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete Buildings (Latest Edition).
  2. ACI 318 - Building Code Requirements for Reinforced Concrete (Latest Edition).
  3. ACI 347 - Recommended Practice for Concrete Formwork (Latest Edition).
  4. ACI Special Publication No. 4: Formwork for Concrete (Latest Edition).

1.03 SYSTEM DESCRIPTION

- A. Structural Concrete Formwork: For surfaces of cast-in-place concrete to be unexposed or to receive rubbed finish.
- B. Design/Performance Requirements: Design, engineering and construction of formwork and shoring is responsibility of the Contractor.
1. Design formwork with sufficient strength to withstand forces due to placement and vibration and sufficient rigidity to maintain specified tolerances.
  2. Design loads, lateral pressure, and allowable stresses in accordance with ACI 347.

1.04 SUBMITTALS

- A. Product Data: Proprietary materials and items, including waterstops, joint systems, and others.
- B. Shop Drawings: Show form construction including jointing, special form joints and reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.

## **PART 2 PRODUCTS**

### **2.01 FORM MATERIALS**

- A. Structural Concrete Forms for Cap and Encasement:
  - 1. New material designed to support wet concrete without deflection and design to withstand external loadings from wave and tidal actions.

### **2.02 RELATED MATERIALS**

- A. Form Coatings: Colorless commercial formulation form release and sealer compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- B. Form Ties: Adjustable length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal, 1-1/2 in. break back, and max. hole left 1-1/4 in. diameter.
- C. Joint Fillers: Premolded mastic strips, asphalt impregnated, ASTM D1751.
- D. Fasteners and Anchorages: Nails, spikes, bolts, lag bolts and other types sized as required to maintain formwork in place.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and measurements required before proceeding with formwork.
- B. Coordinate the installation of joint materials, reinforcing steel, and vapor retarders with placement of forms.

### **3.02 INSTALLATION TOLERANCES**

- A. Allowable tolerances for Structural Concrete Forms shall comply with ACI 301 and ACI 347.
- B. Allowable tolerances for camber in slabs and beams shall comply with ACI 301.

### **3.03 ERECTION**

- A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure.
- B. Construction:

1. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
  2. Build formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
  3. Provide openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
  4. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
  5. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
  6. Provide temporary openings at bottoms of forms to facilitate cleanout and inspection. Close openings with tight fitting panels and neat joints so that joints will not be apparent in exposed concrete surfaces.
  7. Locate form joints in architectural concrete forms as approved on Shop Drawings. Construct architectural form face prior to forms for unexposed surfaces to provide access for joint treatment and adjustment.
- C. Chamfer exposed corners and edges as indicated, or if not indicated, provide 2 in. x 2 in. at expansion joints, tool adjacent edges to 1/8" radius.
- D. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- E. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.
- F. Construction Joints:
1. Locate and install formed construction joints at rustications or, if not indicated, locate so as not to impair strength and appearance of the structure, and as approved by the Engineer.
  2. Provide keyways at least 1-1/2 in. deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs. (unless otherwise noted or indicated).
  3. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, (except as otherwise indicated).

- G. Isolation Joints in Slabs-on-Ground: Construct continuous joint filler at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundations walls, grade beams, and elsewhere as indicated.
- H. Form Joint Treatment: Gasket, plug, tape, and caulk joints and voids in architectural concrete forms to eliminate leakage.
- I. Waterstops: Provide rubber waterstops in construction joints of below grade walls and in joints between below grade slabs and walls. Install waterstops to form continuous diaphragm in each joint. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.
- J. Form Coatings: Apply after forms are erected and joints are sealed but prior to placing reinforcing steel, anchoring devices, and embedded items.
  - 1. Seal surfaces of wood rustications with 2 coats of form sealer.
  - 2. Spray apply one coat of release agent to formwork faces except where concrete surfaces are scheduled to receive special finishes or applied coatings.
  - 3. Coat steel forms with a non-staining, rust- preventative form oil to protect against rusting. Rust-stained steel formwork is not acceptable.
- K. Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

### 3.04 RE-USE OF FORMS

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Recoat contact surfaces of forms with a form coating compound as specified.

### 3.05 REMOVAL OF FORMS AND SHORING

- A. Remove formwork progressively and in accordance with ACI 301 and ACI 347 so that no unbalanced loads are imposed on the structure.
- B. Do not remove formwork until members have acquired strength required to support their own weight plus imposed loads and the concrete has attained 75 percent of required 28 day compressive strength.
- C. Concrete forms for the steel bulkhead encasement shall not be removed until the concrete has attained 75 percent of required 28 day compressive strength.
- D. Formwork not directly supporting weight of concrete, may be removed after 24 hours after placing concrete, provided concrete is sufficiently hard to not

be damaged by form removal operations, and provided curing and protection operations are maintained.

- E. In the event the Contractor wishes to remove formwork at an earlier time than specified, the Contractor shall pay for and have testing laboratory obtain and test 2 additional concrete test cylinders for each case of early form removal, to confirm strength requirement for early form recovery.

**END OF SECTION**



**SECTION 03 21 00**  
**CONCRETE REINFORCEMENT**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section includes steel reinforcement for cast-in-place concrete.

1.02 REFERENCES

- A. American Concrete Institute (ACI):

1. ACI 301-Specifications for Structural Concrete for Buildings (Latest Edition).
2. ACI 315-Details and Detailing of Concrete Reinforcement (Latest Edition).
3. ACI 318-Building Code Requirements for Reinforced Concrete (Latest Edition).

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

1. ASTM A82-Cold Drawn Steel Wire for Concrete Reinforcement.
2. ASTM A615-Deformed and Plain Billet-Steel Bars for Concrete Reinforcement including Supplement S1.

- C. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI-Manual of Practice.
2. CRSI 63-Recommended Practice for Placing Reinforcing Bars.
3. CRSI 65-Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.

1.03 SUBMITTALS

- A. Shop Drawings: Prepare in accordance with ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures, showing bar schedules, stirrup spacing, diagrams of bent bars, splicing and laps of bars, wire fabric, supports, arrangement of reinforcement, and concrete cover. Include special reinforcement required for openings through concrete. Do not scale dimensions from drawings to determine lengths of reinforcement.

- B. Certificates:

1. Mill test certificates identifying physical and chemical analysis of each load of reinforcing steel delivered.

## **PART 2 PRODUCTS**

### **2.01 REINFORCING MATERIALS**

- A. Reinforcing Bars: ACI 301 unless otherwise specified. Deformed ASTM A 615, including supplementary requirement S1 with the bars marked S, Grade 60.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

### **2.02 RELATED MATERIALS**

- A. Supports for Reinforcement: ACI Class B or C bolsters, chairs and spacers.
  - 1. Wire bar type, plastic coated, epoxy coated or stainless steel.
  - 2. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- B. Tie Wire: 16 ga. annealed; black steel wire for uncoated reinforcement.

### **2.03 FABRICATION**

- A. Fabricate reinforcement in accordance with ACI 315.
- B. Fabricate in lengths so that reinforcement splices not indicated on drawings will occur at points of minimum stress and so that no more than 50 percent of reinforcement is spliced at a location, unless shown otherwise.
- C. Fabricate dowels for footings to wall and columns of same size bars and spacings as wall and column reinforcement above. Lap splices for dowels shall be as indicated herein in conformance with an ACI Class B splice.
- D. Shop fabricate bent and cut bars around openings and sleeves.
- E. Hooks and bends shall conform to ACI 315 unless shown otherwise on the drawings.

### **2.04 REINFORCEMENT SPLICES**

- A. Splice reinforcement in conformance with an ACI Class B tension splice. (1995 ACI 318 Code).

**PART 3 EXECUTION****3.01 PLACING REINFORCEMENT**

- A. Comply with CRSI Manual of Standard Practice, ACI 315, and ACI 318 for details and methods of reinforcement placement and supports, and as herein specified.
- B. Avoid cutting or puncturing vapor retarder during reinforcement placement.
- C. Clean reinforcement of loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
- D. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Dense concrete brick supports may be used for reinforcement in slabs-on-ground and footings.
- E. Place reinforcement to obtain coverages for concrete protection specified in Section 03 31 29, Cast-in-Place Concrete for Marine Structures. Arrange, space, and securely wire tie bars and bar supports to hold reinforcement in position during concrete placement operations.
- F. The clear distance between parallel bars in a layer shall be the nominal diameter of the bar, but not less than one inch.
- G. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with tie wire. Offset end laps in adjacent widths.
- H. Where conduit, piping, inserts, and other penetrations or sleeves interfere with the placing of reinforcing steel, notify Architect/Engineer and obtain directions for relocating prior to placing concrete.
- I. Do not field bend or field cut reinforcing bars around openings or sleeves, unless indicated to do so.

**END OF SECTION**

439197/WPB

CONCRETE REINFORCEMENT  
03 21 00 - 4

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 03 31 29**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

1.01 DESCRIPTION:

- A. The Work consists of the use of fly ash as part of the cementitious material for Cast-in-Place Concrete for Marine Structures. The end product shall be a high quality, low permeability and corrosion resistant concrete. To procure a quality product, it is imperative the 28-day moist curing procedures specified herein be rigorously followed.
- B. To minimize permeability and increase durability, the mix design includes the following attributes: low water-to-cementitious material ratio; limit on maximum large aggregate size; use of water-reducing high-range admixtures (extended life superplasticizer); and Type F fly ash.
- C. Flowable Fill

1.02 REFERENCES

- A. ASTM:
  - 1. ASTM C31: Making and Curing Concrete Test Specimens in the field.
  - 2. ASTM C33: Concrete Aggregates.
  - 3. ASTM C39: Compressive Strength of Molded Concrete Cylinder.
  - 4. ASTM C94: Ready-Mixed Concrete.
  - 5. ASTM C109: Compressive Strength of Hydraulic Cement Mortars.
  - 6. ASTM C143 (Rev. A): Slump of Portland Cement Concrete.
  - 7. ASTM C150: Portland Cement.
  - 8. ASTM C171 (R1986): Sheet Materials for Curing Concrete.
  - 9. ASTM C172: Sampling Fresh Concrete.
  - 10. ASTM C231: Air Content of Freshly Mixed Concrete by the Pressure Method.
  - 11. ASTM C260: Air Entraining Admixtures for Concrete.
  - 12. ASTM C289: Potential Reactivity of Aggregates (Chemical Method).
  - 13. ASTM C309: Liquid Membrane-Forming Compounds for Curing Concrete.
  - 14. ASTM C494: Chemical Admixtures for Concrete.
  - 15. ASTM C618: Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 16. ASTM C881: Epoxy-Resin-Base Bonding Systems for Concrete.
  - 17. ASTM C920: Elastomeric Joint Sealants.
  - 18. ASTM C1077: Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

19. ASTM C1107: Packaged Dry, Hydraulic – Cement Grout (Nonshrink)
20. ASTM D994: Premolded Asphalt Joint Material.
21. ASTM E329: Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials Used in Construction.

B. American Concrete Institute:

1. ACI 211.1 - Selecting Proportions for Normal Weight Concrete.
2. ACI 214R - Evaluation of Compression Test Results of Field Concrete.
3. ACI 301 - Specifications for Structural Concrete for Buildings.
4. ACI 304R - Measuring, Mixing, Transporting and Placing Concrete.
5. ACI 304.2R - Placing Concrete by Pumping Methods.
6. ACI 305R - Hot Weather Concreting.
7. ACI 306R - Cold Weather Concreting.
8. ACI 309R - Consolidation of Concrete.
9. ACI 318 - Building Code Requirements for Reinforced Concrete.

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

1. "Standard Specifications for Highway Bridges".
2. M182 – Burlap Cloth made from Jute or Kenaf and Cotton Mats.
3. T259 – Resistance of Concrete to Chloride Ion Penetration.
4. T260 – Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.

D. US Army Corps of Engineers (USACE): CRD C621 – Specification for Non-Shrink Grout.

### 1.03 SUBMITTALS

A. Action Submittals:

1. Product Data for Concrete Mix Proportions.
  - a. Proportions by weight of ingredients in mix.
  - b. Solid volume calculation of ingredients.
  - c. Air content.
  - d. Unit weight.
  - e. Water-cementitious ratio.
  - f. Trial mix compressive strengths at 3, 7, and 28-days.
2. Manufacturer's Technical Data Sheet:
  - a. Concrete admixtures.
  - b. Aggregates – Fine and Course.
  - c. Fly Ash.
  - d. Bonding Compound.
  - e. Epoxy Adhesive.
  - f. Repair Mortar.

3. Mix Designs:
  - a. Laboratory trial mix designs based on Method 1 of ACI 301.
  - b. Field experience mix designs based on Method 2 of ACI 301, plus the 30 consecutive test results of past performance.
  - c. Historical statistical data used for basis of each mix design.
  - d. Include specific admixture names and proportions for each mix design.
  - e. Submit separate mix designs for each specified strength mix, tremie mix, and pump mix.
  - f. Indicate on each mix where the concrete will be used in the structure.

B. Informational Submittals:

1. Manufacturer's recommendation for corrosion inhibiting admixture dosage, method of batching, and any changes in finishing procedures or timing.
2. Manufacturer's instructions for batching, placing, finishing, and curing of concrete.
3. Certificates:
  - a. Material Certificates, signed by Manufacturer and Contractor, certifying that each material item and product complies with specified requirements.
  - b. Qualification Certificates signed by the listed agencies, certifying that the Plant, Testing Agency and Technician meets the specified qualification requirements.
  - c. Manufacturer's Certificate of Compliance that microsilica mineral admixture complies with requirements of this specification.
  - d. Manufacturer's Certificate of Proper Installation for placement, finishing, and moist curing techniques to be used.

C. Placement Log: Prepare and maintain a log of cast-in-place marine concrete containing at the minimum the following information:

1. Date of pour.
2. Location and extent of pour.
3. Quantity of concrete.
4. Air temperature.
5. Tests and samples taken.
6. Curing method used.
7. Date of form removal.

1.04 QUALITY ASSURANCE

- A. Maintain in the field office, as a minimum, a copy of ACI 301.

- B. Ready Mixed Concrete Plant Qualification: Currently certified to comply with approval requirements of one or more of the following:
  - 1. Concrete Materials Engineering Council.
  - 2. Check List for Plant Certification of the National Ready Mixed Concrete Association.
  - 3. Prestressed Concrete Institute.
  
- C. Testing and Inspection Agency Qualification: In addition to the requirements of Section 01400, currently accredited by one or more of the following:
  - 1. Concrete Materials Engineering Council.
  - 2. National Voluntary Laboratory Accreditation Program (NVLAP).
  - 3. Other accreditation authority of equal standing to the above, on the basis of its compliance with the requirements of ASTM C1077.
  
- D. Testing and Inspection Technician Qualification: “ACI Certified Concrete Field Technicians Grade I” or person with equivalent qualifications.
  
- E. Concrete Preconstruction Conference:
  - 1. A Concrete Preconstruction Conference shall be held at the Concrete Supplier's Yard to be attended by the Contractor and his concrete supplier, manufacturer's technical representative(s), the Owner, and the Engineer or RFR. The Contractor and the concrete supplier shall present their proposed methods for the following items:
    - a. Materials, mixing, transporting, placing, finishing and curing concrete;
    - b. Evaporation Prevention Procedures for protecting concrete from plastic shrinkage cracking during placing and finishing;
    - c. Protecting fresh concrete from rain or other adverse weather; and
    - d. Schedule for production of design mix, demonstration batches and production.
  - 2. The admixture and fly ash manufactures shall provide a qualified technical representative(s) who shall be available to assist the Contractor, concrete supplier, and Engineer throughout construction. The qualifications of the technical representative(s) shall be submitted to the Engineer for review and approval prior to construction. The representative(s) shall review the Contractor's design mix, attend the Concrete Preconstruction Conference, inspect the trial batches, inspect the Contractor's first concrete production casting and provide any other technical assistance requested by the Contractor, concrete supplier, or Engineer.
  - 3. At the Concrete Preconstruction Conference, the Contractor shall submit to the Engineer for approval a detailed written Quality Control Plan to address each of the above items. The manufacturer’s technical

representative(s), who shall recommend approval or disapproval to the Engineer, shall review the Contractor's Quality Control Plan (Plan) in detail. Concrete demonstration batches shall only be prepared under this Section in accordance with this Plan or revised Plan that has been approved by the Engineer. This Plan may be modified as a result of the demonstration batch operation upon approval of the Engineer.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. Products furnished in conjunction with the Work of this section shall be those of one manufacturer, to the fullest extent possible, to achieve structural compatibility, and standardization for appearance and maintenance.

### **2.02 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C150, Type II. Use one brand of Type II cement throughout the project.
- B. Fly Ash (Pozzolan): Class F fly ash in accordance with ASTM C618, except as modified herein:
  - 1. ASTM C618, Table 1, Loss of Ignition: Maximum 3 percent.
  - 2. ASTM C618, Table 2, Water Requirement: Maximum 100 percent of control.
  - 3. ASTM C618, Table 3, Effectiveness in Contributing to Sulfate Resistance: Procedure A after 6-month sulfate exposure, maximum 0.05 percent.
  - 4. ASTM C618, Table 3, Effectiveness in Contributing to Sulfate Resistance: Procedure B, expansion of test mixture as a percentage of sulfate resistance cement control, after at least 6-month exposure, maximum 100 percent.
  - 5. Use one source of fly ash throughout project.
  - 6. Add fly ash with cement.
- C. Aggregates:
  - 1. Coarse: Gradation size shall be #67, in conformance with ASTM C33. Clean, washed, sound and crushed, from a single source. Other gradation sizes will not be permitted.
  - 2. Fine: ASTM C33, clean, washed natural sand, sound and uncoated grains. Screenings are not acceptable.
  - 3. Aggregates shall be free of chlorides.
  - 4. Aggregates shall be free of substances that are deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Test in accordance with ASTM C289.

5. Aggregates shall be washed before use if required.
- D. Water: Clean, potable, not containing chloride ions.
- E. Admixtures - Chloride Content:
1. Admixtures shall not contain more chloride ions than are present in the local municipal drinking water.
  2. The maximum water soluble chloride ion concentration in hardened concrete (contributed from water, aggregates, cementitious materials and admixtures) shall not exceed 0.10 percent by weight of cement.
  3. Admixtures shall not contain calcium chloride.
  4. Submit certification stating that each specific admixture does not contain calcium chloride or chloride ions, and that they were not used in the manufacturing process.
- F. Air-Entraining Admixture: ASTM C260 neutralized Vinsol resin. Source Products/Mfgs.:
1. Sika AER/Sika Corp.
  2. MB-VR/Master Builders, Inc.
  3. Daravair/W.R. Grace.
- G. Water-Reducing Admixture: ASTM C494, Type A.
- H. Source Products/Mfgs.:
1. Darex WRDA-79/W.R. Grace.
  2. Pozzolith 220N/Master Builders, Inc.
  3. Plastocrete 161/Sika Corp.
- I. Water-Reducing, High Range and Retarding Admixture (Extended Life Superplasticizer): ASTM C494, Type G. Source Products/Mfgs.:
1. Rheobuild 716/Master Builders, Inc.
  2. Eucon 537, Euclid Chemical Co.
  3. Daracem-100/W.R. Grace.
- J. Non-Chloride Accelerator Admixture: ASTM C494, Type C, and containing no chloride ions. Source Products/Mfgs. includes:
1. Daraset/W.R. Grace.
  2. Pozzutec 20, Master Builders, Inc.
  3. Plastocrete 161FL, Sika Corp.

- K. Water Reducing, Retarding Admixture: ASTM C494, Type D. Source Products/Mfgs.:
1. Pozzolith 100XR/Master Builders, Inc.
  2. Daratard 17/W.R. Grace.
  3. Plastocrete 161MR/Sika Corp.

## 2.03 RELATED MATERIALS

- A. Non-Shrink Grout: ASTM C1107 and USACE CRD-C621, non-metallic factory pre-mixed grout, minimum compressive strength of 2400 psi in 2 days and 7000 psi in 28 days. Source Products/Mfgs.:
1. Masterflow 713/Master Builders, Inc.
  2. Euco-NS/Euclid Chemical Co.
  3. Five Star Grout/U.S. Grout Corp.
  4. Vibropruf No. 11/Lambert Corp.
- B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 oz. per sq. yd., complying with AASHTO M 182, Class 3.
- C. Moisture-Retaining Cover: One of the following, complying with ASTM C171.
1. Waterproof paper.
  2. Polyethylene film.
  3. Polyethylene-coated burlap.
- D. Evaporation Retarder Film:
1. Evaporation retarder film shall meet or exceed the requirements of this specification. Dilution and application at the job site shall conform to the manufacturer's instructions.
  - 2.
  3. An independent laboratory approved by the Engineer shall test the product. The laboratory shall supply the certification that the product meets or exceeds the requirements of this specification and this certification shall be delivered with the product.
  4. Testing shall confirm the monomolecular film applied at the recommended rate shall reduce evaporation as follows:
    - a. Not less than eighty percent when shaded and winds blowing at 10 MPH;
    - b. Not less than forty percent when exposed to the sunlight without wind blowing.
  5. Testing shall be for a duration of seven hours. Testing conditions shall be as follows:

- a. Temperature not less than 70 degrees F;
  - b. Humidity not greater than 25 percent.
6. CONFILM as manufactured by BASF Chemical Company, Inc. is an approved product.
- E. Bonding Compound: Acrylic or Styrene Butadiene base. Source Products/Mfgs.:
1. Acrylbond/Lambert Corp.
  2. Sonocrete/Sonneborn-Rexnord.
  3. Acrylic Bondcrete/The Burke Co.
  4. Acryl 60/Thoro Systems, Inc.
- F. Epoxy Adhesive for dowel installation: ASTM C881, Type 1, Grade 1, Class B, Two- component material suitable for use on dry or damp surfaces. Source Products/Mfgs.:
1. Sikadur Hi-Mod/Sika Corp.
  2. Euco Epoxy 452 or 620/Euclid Chemical Co.
  3. Epiweld 580 or 560/Lambert Corp.
  4. Probond 822 or 823/Protex.
- G. Repair Mortar: Two-component, polymer modified, cementitious mortar, designed to develop minimum compressive strength of 5,000 psi in 3 days, 6,500 psi in 28 days (ASTM C109), and bond strength of 2200 psi in 28 days. Source Products/Mfgs.:
1. SikaTop 122 Repair Mortar/Sika Corp.
  2. Euco Verticoat/Euclid Chemical Co.
- H. Sealing Materials: Material for sealing and filling joints and for sealing premolded joint filler material, shall be a multipart polyurethane, nonsag, immersible system, 100 percent solids compound, ASTM C920, Type M, Grade NS, Class 25, with a shore D hardness of 35 to 50. Source Products/Mfgs.:
1. Sikaflex 2cNS/Sika Corp.
  2. Sonneborn NP-2/BASF.
- I. Premolded Asphalt Joint Material: ASTM D994.
- J. Penetrating Sealer: Alkylalkoxysilane penetrating sealer, with 40 percent silane and active materials, meeting the following requirements:
1. Resistance to Chloride-ion Penetration:
    - a. Less than 0.52 pounds per cubic yard (Criteria of 1.5) at the ½-inch level.

- b. 0.00 pounds per cubic yard (Criteria of 0.75) at the 1-inch level.
  - 2. Minimum Percent Reduction – NCHRP 244:
    - a. Water weight gain – 85% reduction (Series II – cube test).
    - b. Absorbed Chloride – 87% reduction (Series II – cube test).
    - c. Absorbed Chloride – 95% reduction (Series IV – Southern climate).
  - 3. Scaling Resistance – ASTM C672: Zero (0) rating – “No Scaling” (100 cycles).
  - 4. VOC Compliant EPA: Less than 350 g/l VOC content (EPA Method 24).
  - 5. Enviroseal 40, as manufactured by BASF Chemical Company, Inc., is an approved product.
- K. Liquid Membrane-Forming Compound: ASTM C309, white-pigmented, Type 2, Class B.
- L. Cement Drypack Mix: Combine one part Portland cement to two-parts fine aggregate and water sufficient to hydrate cement and produce a stiff mix. Do not mix more than can be used in 30 minutes at a time.

#### 2.04 PROPORTIONING AND DESIGN OF MIXES

- A. Provide design mixes for each type and strength of concrete by either laboratory trial batch or past field experience methods as specified in ACI 301.
- 1. Proportion materials as specified in ACI 211.1, except as modified herein.  
Class F Fly Ash shall be utilized at the rate of 25 percent maximum to 20 percent minimum of the total cementitious material on a pound for pound basis.
  - 2. The use of a high-range water-reducing (Type G – Extended Life Superplasticizer) admixture is required. The high-range water-reducing admixture shall be compatible with fly ash and all admixtures.
  - 3. Do not begin concrete production until the Engineer has reviewed mixes.
- B. Pump Mix Design: Provide same proportions as for other concrete specified herein, except use rounded pea gravel aggregate, ACI 304.2R.
- C. Tremie Mix Design: Provide same proportions as for other concrete specified herein, except that the cement content shall be 752 pounds/cubic yard, the slump shall be 6 inches to 9 inches and the aggregate shall be rounded pea gravel (Number 9 coarse aggregate). Tremie mix shall also include an antiwashout admixture. Rheomac UW450, as manufactured by BASF Chemical Company, Inc., is an approved product.

- D. Determine Required Average Strength ( $f'_{cr}$ ) in accordance with ACI 318, Chapter 5, and ACI 301. Evaluate compressive strength results of field concrete in accordance with ACI 214.
1. Standard Deviation:
    - a. Based on at least 30 consecutive tests or two groups of consecutive tests totaling at least 30 tests.
    - b. Where based on less than 30 consecutive tests, standard deviation shall be established using modification factor.
  2. Required Average Strength:
    - a. Based on specified compressive strength plus the established standard deviation times a multiplier.
    - b. Submit written documentation showing all computations used to determine Required Average Strength.
  3. Documentation of Average Strength:
    - a. Based on field strength test records or trial mixtures.
    - b. Test records consisting of at least 10 but not more than 30 consecutive tests may be used, provided test records occur during a period of time not less than 45 days.
- E. Schedule of Concrete Types: Provide mix designs for the compressive strength scheduled with the following minimum properties:

Minimum 28-day Compressive Strength (PSI)	Maximum Water-Cementitious Material Ratio	Minimum Portland Cement Content (lb/cubic yard)
5000 - Classified As ACI Exposure Class C2	Determined by Mix Design Testing, Not to Exceed 0.40 lb/lb.	564

1. Optimum water-cementitious material ratio for mix designs of 5000 psi and greater, 28-day compressive strength shall be determined by various mix designs, not to exceed 0.40.
2. The water-cementitious ratio shall be calculated using total dry weight of cementitious material (cement and fly ash) and total water (mix water and aggregate moisture).
3. Each admixture shall be dispensed separately into the mix and at different times during mixing, unless otherwise approved in writing by the microsilica manufacturer.
4. Introduce admixtures in quantities and according to methods recommended by the admixture manufacturer. Do not use calcium chloride.

- F. Air Entrainment: Provide concrete with total air content as listed below, and as measured in accordance with ASTM C231. Mix designs utilizing superplasticizer shall use a neutralized Vinsol resin air-entraining admixture.
  - 1. Air content: 1 percent to 5 percent.
- G. Slump Limits: Concrete, when placed at the forms, shall have a slump within the following limits as measured in accordance with ASTM C143.
  - 1. Slump Range: 3 inches to 7 inches.

## 2.05 CONCRETE MIXING

- A. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix number, mix strength, mix time, quantity, and amount of water introduced at the plant and at the site.
- B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
  - 1. Determine total mixing time for concrete in accordance with ASTM C94 for type of mixing equipment utilized.
  - 2. Do not use concrete that has been in truck for more than 1-1/2 hours after addition of water, or had more than 300 revolutions, or concrete that has become harsh or nonplastic. The 1-1/2 hour time limit may be extended by approval in writing by the Engineer, with use of the superplasticizer. Provide relative information on extended life and additional site dosage with mix design.
  - 3. If the slump varies from the target values in excess of 1-1/2 inches or the air content varies from the target air in excess of 1-1/2 percent, make immediate adjustments to the concrete mix, to correct these properties for succeeding batches.
  - 4. No water shall be added at the plant or at the site, in excess of the design water as specified in the approved mix design.
  - 5. Concrete containing a superplasticizer shall not have water added at the site. If necessary, an additional dose of superplasticizer may be added at the site to extend workability.
  - 6. The Contractor shall bear total responsibility for site additions to the mix and for the effects of such changes on the quality, durability and strength of the concrete.
  - 7. Ready mix supplier shall certify to the compatibility of all materials and admixtures being proposed.
  - 8. When air temperature is between 85 and 90 degrees F (30 and 32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes. Do not place concrete that is 90 degrees F or higher.

9. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

## 2.06 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
  1. Cement: ASTM C150, Type I, Portland.
  2. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m).
  3. Aggregates: ASTM C33, natural sand, fine and crushed gravel or stone, coarse.
  4. Aggregates: ASTM C33, natural sand, fine.
  5. Admixture: ASTM C618, fly-ash mineral.
  6. Water: Comply with ASTM C94/C94M.
  7. Strength: 80 to 150 psig at 28 days.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION AND PREPARATION

- A. Examine formwork, reinforcing steel, embed inserts, sleeves, and joint materials for proper installation.
- B. Do not begin placement of concrete until formwork and reinforcement have been examined and approved by Engineer.
- C. Verify that formwork and structural excavations have been cleaned of foreign matter and water removed.
- D. Do not proceed until unsatisfactory work has been corrected.
- E. Notify Engineer at least 2 working days in advance of scheduled pour to allow time for adequate observation.

### 3.02 INSTALLATION

- A. Erect formwork and joints, and install reinforcing steel and accessories as required and specified in Sections 03 10 00 and 03 21 00.
- B. Concrete Placement:
  1. Moisten wood forms immediately before placing concrete where form coatings are not used.
  2. Comply with ACI 304R, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete, and as herein specified.
  3. Deposit concrete in forms in horizontal layers not deeper than 24 inches

- and in a manner to avoid inclined construction joints. Limit vertical drop not to exceed 4-1/2 feet.
4. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
  5. Consolidate placed concrete by internal mechanical vibrating equipment supplemented by hand spading, rodding, or tamping in accordance with ACI 309R. Vibrators shall have a minimum frequency of 8,000 vibrations per minute with amplitude to consolidate effectively.
    - a. Insert vibrators vertically at spacings that are approximately 1-1/2 times the radius action so that the area visibly affected by the vibrator overlaps the adjacent just-vibrated area by a few inches.
    - b. Spacing shall not exceed 18 inches on center. Do not move vibrators horizontally through concrete.
    - c. Keep the vibrator at least 2-1/2 inches away from the form face.
    - d. Rapidly plunge the vibrator vertically through the freshly placed concrete layer at least 6 inches into preceding layer. With a surging up and down motion slowly extract the vibrator from the concrete until the vibrator head is about to become exposed then rapidly remove the vibrator completely to prevent air bubbles from becoming drawn into the top of the freshly placed layer.
    - e. Keep the vibrator moving while in the concrete to prevent harmonic vibrations from distorting forms or causing form failure.
  6. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
  7. Bring slab surfaces to correct level with straightedge and strikeoff. Do not disturb slab surfaces prior to beginning finishing operations.
  8. Maintain reinforcing, inserts, embeds, and joints in proper position during concrete placement operations.
- C. Pumping Placement of Concrete: Provide pumps, pipelines and accessory equipment in accordance with ACI 304R and ACI 304.2R and as herein specified.
1. Provide minimum pump size of 3 inch diameter.
  2. Provide standby pump at the site for use in case of a breakdown or plugged pipeline.
- D. Reinforcement Concrete Coverage:
1. Concrete cast against and permanently exposed to earth: 4 inches.
  2. Concrete exposed to a saltwater environment: 4 inches.
- E. Rain Protection: In the event of rain during concrete placement, terminate pour as soon as practicable at a point approved by the Engineer and protect freshly placed concrete with a waterproof covering that will prevent marring or damage of surfaces.

- F. Hot Weather Placing: Comply with ACI 305R and as herein specified.
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F.
  - 2. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
  - 3. Use approved water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions.
  
- G. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306R and as herein specified.
  - 1. When air temperature is below 40 degrees F maintain concrete mixture temperature between 50 and 70 degrees. F.
  - 2. Do not use frozen materials or place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.

### 3.03 FINISH OF FORMED SURFACES

- A. Repair of tie holes and deep depressions:
  - 1. Flush with clean water and tamp to overfill with cement drypack mix.
  - 2. Cure as specified for concrete and grind flush with adjacent surface.
  
- B. Repair of Rock Pockets, Honeycomb, and Sand Streaks:
  - 1. Cut and remove concrete to at least one inch deep with sides perpendicular to surface.
  - 2. Flush with clean water, coat with Neat cement paste, and then fill with cement drypack mix in at least two layers to overfill.
  - 3. Cure as specified for concrete and grind smooth and flush with adjacent surfaces.
  
- C. As Cast Finish: For formed concrete surfaces.
  - 1. Repair and patch tie holes and defective areas and rub down or chip off fins and other projections exceeding 1/4 inch in height.
  - 2. Fill and patch bug holes 1/4 inch and larger.
  - 3. Smooth Finish: Saturate the surface with water and rub with a carborundum stone.
  
- D. All exposed edges of concrete shall have a minimum 2 inch chamfer except as shown on the drawings.

## 3.04 CONCRETE FINISHING – SLABS AND HORIZONTAL EXPOSED SURFACES

## A. Finishing Operations:

1. An evaporation retardant film shall be used to help reduce moisture loss at the concrete surface. Requirements for evaporation retarder films are stated in Sub-article 2.3 D.
2. The concrete shall be finished as soon as possible and without delay. The timing of this operation can be extremely critical with high performance low water-cementitious material ratio concrete.
3. Contractor shall maintain adequate surface moisture protection through misting or fog spraying and the application of an evaporation retardant film.
4. The “Evaporation Preventative Procedures” detailed in Sub-article 3.4 C. shall be employed during finishing and until curing begins to prevent plastic shrinkage cracking.
5. Contractor shall use, as much as possible, the same finishing crew throughout the duration of the project. If through turnover, the Contractor's finishing crews become inadequately experienced, the Contractor shall, with collaboration with the manufacturer's technical representative, train the new finishing crew in the appropriate finishing procedures.
7. Finish concrete per the requirements of ACI 302.1R.
8. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
9. Do not use “jitterbugs” or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer of mortar, which will be weak and cause cracks or delamination, to accumulate.
10. Do not dust surfaces with dry materials.
11. Round off edges with steel edging tool, except where beveled or chamfered edges are shown. Steel edging tool radius shall be 1/4 inch for slabs subject to wheeled traffic.

## B. Slabs – Steel Troweled with Broomed Finish:

1. Finish by screeding and floating with straight edges to bring surfaces to required finish elevation.
2. While concrete is still green, but sufficiently hardened to bear a person's weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
3. Use sufficient pressure on wood floats to bring moisture to surface.
4. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
5. Do not use dry cement or additional water during troweling, nor will excessive troweling be permitted.

6. Finish surface by drawing fine-hair broom lightly across surface.
7. Broom in same direction and parallel to expansion joints, or, in the case of included slabs, perpendicular to slope.

C. Evaporation Preventative Procedures:

1. Evaporation preventative procedures shall require the use of continuous misting or fogging during the casting and finishing of all concrete, until moist curing is initiated. Moist curing shall begin as soon as possible. However, under no circumstances shall it be initiated later than 60 minutes after casting.
2. Immediately after screeding, the evaporation retarder film shall be sprayed onto the concrete surface in accordance with the manufacturer's recommendations. Immediately following the application of the retarder film, the concrete surface shall be floated. Straight edge corrections and moist curing operations shall be performed expeditiously.

### 3.05 CURING

A. General:

1. Concrete requires 28-days moist (wet) curing. This 28-day moist curing shall be a combination of 7-days (168 hours) of continuous moist (kept wet) curing and 21-days of continual curing by means of applying a liquid type membrane-forming curing compound. The concrete product shall be protected from construction traffic. No other curing concepts, procedures, or options will be allowed.
2. During the initial 168-hour continuous moist cure, concrete surfaces shall be maintained in a continuously wet condition.

B. Curing Procedures:

1. Curing of concrete shall begin immediately after the finishing operation is completed. Curing duration shall be for a total of 28-days. Curing duration shall be 7-days of continuous moist curing (fresh water) combined with 21-days of additional curing provided by a dual application of a liquid type membrane-forming curing compound to be applied to all surfaces. A film of water shall be kept on the surface by fogging until covering materials are in place. The concrete surface shall not be allowed to dry.
2. Curing covers shall be applied as soon as the concrete surface can be covered without significant marring. Curing covers shall be saturated with potable water immediately upon placement. Minor marring of the surface will be tolerated in order to begin moist curing as soon as possible. Provisions shall be made for additional applications of water under the plastic sheeting. This shall be accomplished by using soaker hoses or other methods approved by the Engineer. Manual application

will not be allowed. Water applications shall be either continuous or controlled by automatically timed flow controls. In any event, the concrete surface and burlap material shall remain continuously wet throughout the 7-day curing period.

3. During the 7-day moist curing period, no interruptions to the curing operation will be permitted. Forms shall stay in place for the entire 7-day period. All top horizontal surfaces shall have continuous moist curing without any breaks during the 7-day moist curing period.

C. Liquid Membrane-Forming Curing Compound:

1. Immediately after completion of the 7-day moist curing and the removal of the burlap and plastic covers, an approved liquid membrane-forming curing compound shall be mixed and applied in two independent coats, in opposing directions (90 degrees to each other) to all surfaces in accordance with the manufacturer's recommendations, subject to the rate of application specified herein.
2. The rate of application of membrane curing compound for each coat shall be at least one gallon to every 200 square feet maximum, for each coat of exposed surface to be cured. Each coat shall be colored differently in order to facilitate application at the prescribed coverage. The top coat shall be colored white. The first coat shall be colored to present a high contrast to the white top coat.
3. Under no circumstances shall the concrete surface be allowed to dry prior to the membrane curing compound application. Deck or

component usage during this 21-day period shall be at a minimum and the use of covered walking paths is required.

- D. Penetrating Sealer: After moist 28-day curing process is complete; all exposed concrete surfaces shall be cleaned and coated with a penetrating sealer conforming with Article 2.3.J. Two coats of penetrating sealer shall be applied, at the rate of 125 square feet per gallon and perpendicular to each other, and in accordance to the manufacturer's printed instructions.

- E. Protection of Concrete: Concrete shall remain undisturbed during the entire 28-day curing period. The concrete surface shall not be used for storage, traffic or construction area. The concrete may only be used after the 28-day curing period if it is covered with plywood, planks, timbers or other material approved by the engineer.

### 3.06 CONSTRUCTION JOINTS

- A. Construction Joints: Joints not shown on the drawings shall be made and located so as to least impair the strength of the structure and shall be subject to approval of the Engineer. In general, they shall be located near the middle of

the spans of slabs, beams and girders unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints shall be perpendicular to the main reinforcement.

- B. Reinforcement in Construction Joints: All reinforcing steel shall be continued across joints. Keys and inclined dowels shall be provided as indicated. Longitudinal keys at least 1-1/2 inches deep shall be provided in all joints in walls and between walls and slabs or footings.
- C. Preparation of Surface: The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed.
- D. Bonding: Bond shall be obtained by use of an approved bonding agent.
- E. Contraction (Expansion) Joints:
  - 1. Locate and install formed contraction joints, as shown on the Contract Drawings and on the accepted reinforcement shop drawings.
  - 2. Provide contraction joints perpendicular to main reinforcement. Terminate all reinforcement at contraction joints, providing the appropriate ACI bent hooks at the ends of all continuous main reinforcement.
  - 3. Provide the open contraction joint width, as shown, with the accepted waterstop between the concrete pours.
  - 4. Fill the contraction joint width with an accepted premolded joint filler material and seal all exposed faces of the joint filler material with an accepted elastomeric sealant.

### 3.07 EMBEDDED ITEMS

- A. Anchors and bolts, frames or edgings, hangers and inserts, pipe supports, pipe sleeves, metal ties, conduits, drains, and all other materials in connection with concrete construction shall, where practicable, be placed and secured in position prior to placing concrete.
- B. All sleeves, inserts, anchors, and embedded items required for adjoining Work or for its support shall be placed prior to concreting. All subcontractors, whose work is related to the concrete or must be supported by it, shall be given ample notice and opportunity to introduce or furnish embedded items before the concrete is placed. All ferrous metal sleeves, inserts, anchors, and other embedded ferrous items exposed to the weather or saltwater environment shall be AISI Type 316 stainless steel.
- C. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids. Aluminum shall not be embedded in concrete except where

aluminum is protected from direct contact with the concrete by a thick coat of Bitumastic paint.

- D. Reinforcing bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items, but not so as to impair design strengths of the members. If bars are moved more than one bar diameter, the resulting arrangement of bars shall be subject to the approval of the Engineer.

### 3.08 TREMIE CONCRETE

- A. Concrete placed below water shall be by the tremie method. Placement of concrete below the high tide level shall be timed to reduce the amount of concrete placed below water.
- B. The tremie pipe shall be watertight and sufficiently large to permit a free flow of concrete. The discharge end shall be kept continuously submerged in fresh concrete, and the shaft kept full of concrete to a level well above the water surface. The concrete shall be discharged and spread by raising the tremie pipe in a manner to maintain, as nearly as practicable, a uniform flow. The placing of the concrete shall proceed without interruption until the top of the fresh concrete has been brought to the required height.
- C. The methods and equipment to be used shall be subject to approval and shall prevent the washing of the cement from the mixture, minimize the formation of laitance, prevent the flow of water through the concrete before it has hardened, and minimize disturbance to the previously placed concrete. Concrete shall not be deposited in running water or in water having a temperature below 35 degrees F.

### 3.09 DRILLED IN DOWELS

- A. Drill holes to depth shown on the drawings. Hole size shall be a maximum of 1/8 inch larger in diameter than the dowel diameter.
- B. Clean holes with oil free compressed air and cover with masking tape.
- C. The use of rotary drills utilizing diamond core bits is prohibited. Electric impact hammers or other tools which do not provide for the immediate expulsion of the drill cuttings are also prohibited.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades with cement drypack. Mix, place, and cure concrete as specified, to blend with in-place construction.

3.11 FIELD QUALITY CONTROL

- A. The Contractor shall employ a testing laboratory to obtain or make samples, to perform tests and to submit test reports, except as designated otherwise. The testing laboratory and its employees shall be qualified in accordance with ASTM E329, and the inspection and testing activities shall be in accordance with ASTM E329.
- B. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
  - 1. Slump: ASTM C143; one test at point of discharge for each set of compression cylinders taken; additional tests when concrete consistency appears to have changed; and one test on each truck load of concrete delivered to the site.
  - 2. Air Content: ASTM C231 pressure method for normal weight concrete; one for each set of compression cylinders taken.
  - 3. Molded Concrete Compression Cylinders: Sample in accordance with to ASTM C172, process and cure in accordance with to ASTM C31, and prepare and test in accordance with to ASTM C39.
    - a. Obtain one set of four (4) cylinders for each 50 cu. yd., or fraction thereof, for each day's placement of each mix design.
    - b. Test one cylinder at age 3-days or 7-days, as required by job conditions and two (2) cylinders for one valid strength test at 28- days.
    - c. Cure and hold fourth cylinder for testing at 42-days if 28-day test indicated deficient results, or as a spare in case of cylinder damage.
- C. Manufacturers Field Service: Contractor shall provide and pay for services of a qualified technician(s) employed by the manufacturer(s) of the superplasticizer and flyash admixtures to provide the following:
  - 1. Assist the Contractor in proportioning concrete materials for optimum use.
  - 2. Advise the Contractor on proper use of the admixture.
  - 3. Make adjustments of the concrete mix proportions to meet jobsite and climatic conditions.
- D. Reports: Promptly submit four (4) copies of certified written reports of test results, with the following additional data:
  - 1. Time concrete batched and time sampled.
  - 2. Water added at site.
  - 3. Superplasticizer added at site.

4. Strength class.
5. Delivery ticket number.
6. Concrete suppliers mix designation.
7. Location of concrete in the work.

END OF SECTION

439197/WPB

CAST-IN-PLACE CONCRETE  
03 31 29 - 22

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 03 63 00  
CONCRETE DOWELING**

**PART 1 GENERAL**

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American National Standards Institute (ANSI).
  2. ASTM International (ASTM): C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  3. International Conference of Building Officials (ICBO).

1.02 DEFINITIONS

- A. ICBO Reports: Published by ICBO for concrete anchor manufacturers.
- B. Special Inspection: Observation of Work by Special Inspector for conformance to approved design Drawings and Specifications.
- C. Special Inspector: Qualified person who shall demonstrate competence, to satisfaction of building official, for inspection of Work specified within this section.

1.03 SUBMITTALS

- A. Action Submittals:
1. Product Data: Manufacturer's catalog information.
- B. Informational Submittals:
1. Manufacturer's qualifications; include client name, address, contact person, phone number, project location, and description of work.
  2. Manufacturer's instructions for preparation, placement, drilling of holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.
  3. Manufacturer's written letter of certification identifying installer's qualifications to install products.
  4. ICBO Reports:
    - a. Doweling system manufacturer.
    - b. Detailed step-by-step instructions for Special Inspection procedure.

5. Special Inspection report.
6. Manufacturer's Certificate of Proper Installation.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: At least three similar projects with same products within last 3 years.
2. Installer: Trained and certified by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store adhesive cartridges and adhesive components on pallets or shelving in a covered storage area.
- B. Store at temperatures as indicated in manufacturer's literature and ICBO report.
- C. Dispose of When:
  1. Shelf life has expired.
  2. Stored other than per manufacturer's instructions.
- D. Container Markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

**PART 2 PRODUCTS**

2.01 ADHESIVE

- A. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and that fit into manually or pneumatically operated caulking gun.
- B. Meet requirements of ASTM C881/C881M.
- C. Two-component, insensitive to moisture, designed to be installed in adverse freeze/thaw environments.
- D. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
- E. Mixed Adhesive: Nonsag light paste consistency with ability to remain in a 1-inch diameter overhead drilled hole without runoff.

F. Manufacturers and Products:

1. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE-500-SD.

2.02 MIXING NOZZLES

- A. Disposable, manufactured in several sizes to accommodate size of reinforcing dowels.
- B. Nonremovable internal static mixer required to ensure proper blending of components.

2.03 REINFORCING DOWELS

- A. As specified in Section 03 21 00, Concrete Reinforcement.

**PART 3 EXECUTION**

3.01 GENERAL

- A. Dispensing, Metering, and Mixing Adhesive Components: Use portable, automatic metering and mixing device or machine capable of maintaining prescribed mix ratio within deviation of 5 percent or less, by volume.
- B. Install in accordance with manufacturer's recommended instructions.
- C. Dispense components through specially designed static mixing nozzle that thoroughly mixes components and places mixed adhesive at base of predrilled hole.

3.02 DOWEL SIZING AND INSTALLATION

- A. Install per adhesive manufacturer's instructions.
- B. Drilling Equipment:
  1. Drilling Hammers for Dowel Holes: Electric or pneumatic rotary type with medium or light impact.
  2. Hollow drills with flushing air systems are preferred.
  3. Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
  4. Drilling equipment shall roughen inside surface of hole per adhesive manufacturer's recommendation. Smooth bore diamond abrasive bits shall not be used.
- C. Hole Diameter: Use drill bit diameter meeting ICBO Report requirements and as recommended by the manufacturer.

D. Obstructions in Drill Path:

1. When existing reinforcing steel is encountered during drilling and when approved by Engineer, enlarge hole by 1/8 inch, core through existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter; or redrill hole 1 inch from original location, beginning in same line at surface, redirecting drill to miss reinforcing steel.
2. Place dowels in both the misdrilled hole and the new one.
3. When using epoxy anchors, dowels may be prebent prior to installation to 15 degrees to align with other bars. Do not heat dowels to bend.
4. If bars have fused epoxy coating and coating is damaged, recoat damaged area with epoxy.
5. Bent Bar Dowels: Where edge distances are critical, and striking reinforcing steel is likely, drill hole at 10-degree angle or less and use prebent reinforcing bars.

**END OF SECTION**

**SECTION 05 05 23**  
**WELDING**

**PART 1 GENERAL**

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Society of Mechanical Engineers (ASME):
    - a. BPVC SEC V, Nondestructive Examination.
  2. American Society of Nondestructive Testing (ASNT): SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing.
  3. ASTM International (ASTM): A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
  4. American Welding Society (AWS):
    - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
    - b. A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting and Thermalspraying.
    - c. D1.1/D1.1M, Structural Welding Code - Steel.
    - d. D1.4/D1.4M, Structural Welding Code - Reinforcing Steel.
    - e. QC1, Standard for AWS Certification of Welding Inspectors.
  5. International Code Council, Inc. (ICC):

1.02 DEFINITIONS

- A. CJP: Complete Joint Penetration.
- B. CWI: Certified Welding Inspector.
- C. MT: Magnetic Particle Testing.
- D. NDE: Nondestructive Examination.
- E. NDT: Nondestructive Testing.
- F. PJP: Partial Joint Penetration.
- G. PQR: Procedure Qualification Record.
- H. PT: Liquid Penetrant Testing.
- I. RT: Radiographic Testing.

- J. UT: Ultrasonic Testing.
- K. VT: Visual Testing.
- L. WPQ: Welder/Welding Operator Performance Qualification.
- M. WPS: Welding Procedure Specification.

### 1.03 SUBMITTALS

- A. Process in accordance with Section 01 33 00, Submittal Procedures.
- B. Action Submittals:
  - 1. Shop Drawings:
    - a. Shop and field WPSs and PQRs.
    - b. NDT procedure specifications prepared in accordance with ASME BPVC SEC V.
    - c. Welding Data (Shop and Field):
      - 1) Show on Shop Drawings or a weld map complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tails of combined welding and NDE symbols as indicated in AWS A2.4.
      - 2) Distinguish between shop and field welds.
      - 3) Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
      - 4) Welding and NDE symbols shall be in accordance with AWS A2.4.
      - 5) Welding terms and definitions shall be in accordance with AWS A3.0.
      - 6) Submit welding data together with shop drawings as a complete package.
- C. Informational Submittals:
  - 1. WPQs.
  - 2. CWI credentials.
  - 3. Testing agency personnel credentials.
  - 4. CWI reports.
  - 5. Special Inspector reports.
  - 6. Welding Documentation: Submit on appropriate forms in referenced welding codes.

#### 1.04 QUALIFICATIONS

- A. WPSs: In accordance with AWS D1.1/D1.1M (Annex E Forms).
- B. WPQs: In accordance with AWS D1.1/D1.1M (Annex E Forms).
- C. CWI: Certified Welding Inspectors shall be certified in accordance with AWS QC1, and shall have prior experience with the welding codes specified. Alternate welding inspector qualifications require approval by the Engineer.
- D. Testing Agency: Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT-TC-1A.
- E. Special Inspector: A licensed professional engineer, experienced with the design, construction, inspection, and testing of high-strength bolted and welded connections, in accordance with ICC International Building Code, 2006 Ed., Section 1704.3 – Steel Construction, Section 2204.1 – Welding, and Section 2204.2 - Bolting.

#### 1.05 SEQUENCING AND SCHEDULING

- A. Unless otherwise specified, all Submittals required in this section shall be submitted and approved prior to commencement of welding operations.

### **PART 2 PRODUCTS**

#### 2.01 SOURCE QUALITY CONTROL

- A. Contractor shall retain the services of a qualified engineering testing agency, CWI, and Special Inspector, to provide source and field quality control services.
- B. CWI shall be present whenever shop welding is performed. CWI shall perform inspection, as necessary and as directed by the Special Inspector, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1/D1.1M or referenced welding code and as follows:
  - 1. Verifying conformance of specified job material and proper storage.
  - 2. Monitoring conformance with approved WPS.
  - 3. Monitoring conformance of WPQ.
  - 4. Inspecting weld joint fit-up and performing in-process inspection.
  - 5. Providing 100 percent visual inspection of all welds.
  - 6. Supervising nondestructive testing personnel and evaluating test results.
  - 7. Maintaining records and preparing report confirming results of inspection and testing comply with the Work.

- C. Special Inspector shall work in conjunction with the CWI and in accordance with ICC-International Building Code, 2006 Ed., Sections 1704.3, 2204.1 and 2204.2

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Welding and Fabrication by Welding: Conform to governing welding codes referenced in attached Welding and Nondestructive Testing Table.
- B. Welding procedure specifications shall be qualified for notch toughness by limiting heat input; charpy testing of weld metal and heat-affected zone shall be done as a part of the welding procedure qualification. Full-size specimens shall be charpy tested in accordance with ASTM A370 at a test temperature of 30 degF. The minimum average energy of the test coupons shall not be less than 25 foot-pounds.

#### **3.02 NONDESTRUCTIVE WELD TESTING REQUIREMENTS**

- A. Weld Inspection Criteria:
  - 1. Selection of welds to be tested shall be as agreed upon between the CWI, the Special Inspector, and the Contractor.
  - 2. Unless otherwise specified, perform NDT of welds at a frequency as shown below or in the attached table in accordance with the referenced welding codes as follows. Perform UT on CJP groove welds that cannot be readily radiographed. In case there is a conflict the higher frequency level of NDT shall apply:
    - a. CJP Butt Joint Welds: 20 percent random RT.
    - b. CJP Groove Welds: 20 percent random UT.
    - c. Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.
    - d. All Welds: 100 percent VT.
  - 3. Weld Acceptance:
    - a. VT:
      - 1) Structural Pipe and Tubing: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Tubular Connections.
      - 2) All Other Structural Steel: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
      - 3) Stud and Deformed Bar Anchor Connections: AWS D1.1/D1.1M, Paragraph 7.8.

- b. UT: Perform UT of CJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.13.3, Class R Indications.
- c. RT: Perform RT of CJP butt joint welds in accordance with AWS D1.1/D1.1M, Paragraph 6.12.1.
- d. PT or MT:
  - 1) Perform on fillet and PJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.10.
  - 2) Acceptance shall be in accordance with VT standards specified above.

### 3.03 FIELD QUALITY CONTROL

- A. Contractor shall retain the services of a qualified engineering testing agency, CWI, and Special Inspector, to provide source and field quality control services.
- B. CWI shall be present whenever field welding is performed. CWI shall perform inspection, as necessary and as directed by the Special Inspector, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1/D1.1M or referenced welding code and as follows:
  - 1. Verifying conformance of specified job material and proper storage.
  - 2. Monitoring conformance with approved WPS.
  - 3. Monitoring conformance of WPQ.
  - 4. Inspecting weld joint fit-up and performing in-process inspection.
  - 5. Providing 100 percent visual inspection of all welds.
  - 6. Supervising nondestructive testing personnel and evaluating test results.
  - 7. Maintaining records and preparing report confirming results of inspection and testing comply with the Work.
- C. Special Inspector shall work in conjunction with the CWI, in accordance with ICC-International Building Code, 2006 Ed., Sections 1704.3, 2204.1, and 2204.2.
- D. Special Inspector's Reports: Submit two (2) signed-and-sealed (embossed) copies of the Special Inspector's Report, including the inspection and test results of each weld inspected and/or tested, to the Owner and the Engineer, in accordance with ICC-International Building Code, 2006 Ed., Sections 1704.3, 2204.1, and 2204.2.

### 3.04 WELD DEFECT REPAIR

- A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

## 1. “Welding and Nondestructive Testing” table.

<b>Welding and Nondestructive Testing</b>						
<b>Specification Section</b>	<b>Governing Welding Codes or Standards</b>	<b>Submit WPS</b>	<b>Submit WPQ</b>	<b>Onsite CWI Req'd</b>	<b>Submit Written NDT Procedure Specifications</b>	<b>NDT Requirements</b>
31 41 17 Sheet Piles	AWS D1.1/D1.1M, Structural Welding Code – Steel	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	100% VT; see Section 31 41 17 <u>and Paragraph 3.02, herein.</u>
05 50 13 Metal Fabrications	AWS D1.1/D1.1M, Structural Welding Code–Steel	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	100% VT; see Section 05 50 13 <u>and Paragraph 3.02, herein.</u>

**END OF SECTION**

**SECTION 05 50 13**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section includes all steel and metal shapes and plates not specified in other sections.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Galvanizers Association (AGA): Inspection of Products Hot-Dip Galvanized After Fabrication.
  2. American Institute of Steel Construction (AISC): S329, Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
  3. American Iron and Steel Institute (AISI): Stainless Steel Types.
  4. American National Standards Institute (ANSI).
  5. American Society of Mechanical Engineers (ASME): B1.1, Unified-inch Screw Threads (UN and UNR Thread Form).
  6. American Society of Safety Engineers (ASSE): A10.11, Safety Requirements for Personnel and Debris Nets.
  7. American Welding Society (AWS):
    - a. D1.1, Structural Welding Code - Steel.
    - b. D1.6, Structural Welding Code - Stainless Steel.
  8. ASTM International (ASTM):
    - a. A6, General Requirements for Rolled Steel Plate Shapes, Sheet Piling, and Bars for Structural Use.
    - b. A27, Steel Castings, Carbon, for General Application.
    - c. A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - d. A108, Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
    - e. A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - f. A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - g. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - h. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

- i. A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
  - j. A240/A240M, Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
  - k. A276, Specification for Stainless Steel Bars and Shapes.
  - l. A283/A283M, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  - m. A325, Specification for Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.
  - n. A380, Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
  - o. A384, Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
  - p. A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
  - q. A489, Specification for Carbon Steel Lifting Eyes.
  - r. A496, Steel Wire, Deformed, for Concrete Reinforcement.
  - s. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - t. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - u. A563, Specification for Carbon and Alloy Steel Nuts.
  - v. A572, High Strength, Low Alloy Columbium-Vanadium Steels of Structural Quality.
  - w. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - x. A786/A786M, Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
  - y. A793, Specification for Rolled Floor Plate, Stainless Steel.
  - z. A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
  - aa. A992/A992M, Specification for Steel for Structural Shapes for Use in Building Framing
  - bb. F436, Specification for Hardened Steel Washers.
  - cc. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
  - dd. F594, Specification for Stainless Steel Nuts.
  - ee. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
9. International Code Council, Inc. (ICC):
- a. Evaluation Reports for Concrete and Masonry Anchors.

### 1.03 DEFINITIONS

- A. Corrosive Area: Location at or below top of bulkhead cap or under water.
- B. Exterior Area: Location not protected from the weather by an enclosed structure.
- C. Submerged: Location at or below EL -1.0 MSL.

### 1.04 SUBMITTALS

- A. Process in accordance with Section 01 33 00, Submittal Procedures.
- B. Action Submittals:
  - 1. Shop Drawings:
    - a. Metal fabrications, including welding and fastener information.
    - b. Specific instructions for concrete anchor installation, including drilled hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.
    - c. Anchor bolts, cast-in-place and drilled-in.
    - d. Specific instructions for concrete anchor installation, including drilled hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.
    - e. Welding Data (Shop and Field), in accordance with Section 05 05 23, Welding.
- C. Informational Submittals:
  - 1. Concrete Drilled Adhesive Anchors:
    - a. Manufacturer's product description and installation procedures.
    - b. Current test data or ICC Evaluation Report.
    - c. Adhesive Anchor Installer Certification.
  - 2. Hot-Dip Galvanizing: Certificate of compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.
  - 3. Welded Deformed Bar Anchors:
    - a. Manufacturer's product data.
    - b. Manufacturer's certification that material was manufactured, sampled, tested, and inspected in accordance with ASTM A496, and found to meet or exceed the requirements specified therein.
    - c. Manufacturer's certified test report of the testing results.
  - 4. Welding documentation, CWI and testing agency credentials, and CWI and Special Inspector reports in accordance with Section 05 05 23, Welding.

### 1.05 QUALITY ASSURANCE

- A. Qualifications:

1. Adhesive Anchor Installers: Trained and certified by manufacturer.
  2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.
  3. Welders, Welding Operators, Welding Inspectors, and Welding Procedures: Refer to Section 05 05 23, Welding.
- B. Contractor’s Special Inspector: A licensed professional engineer, experienced with the design, construction, inspection, and testing of high-strength bolted and welded connections, in accordance with ICC-International Building Code, 2006 Ed., Section 1704.3 – Steel Construction, Section 2204.1 – Welding, and Section 2202.2 – Bolting.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Insofar as practical, factory assemble items specified herein. Assemblies that due to necessity have to be shipped unassembled shall be packaged and tagged in manner that will protect materials from damage and will facilitate identification and field assembly.
- B. Package stainless steel items in a manner to provide protection from carbon impregnation.
- C. Protect painted coatings and hot-dip galvanized finishes from damage due to metal banding and rough handling. Use padded slings and straps.
- D. Store fabricated items in dry area, not in direct contact with ground.

**PART 2 PRODUCTS**

2.01 GENERAL

- A. For hot-dip galvanized steel that is exposed to view and does not receive paint, limit the combined phosphorus and silicon content to 0.04 percent. For steels that require a minimum of 0.15 percent silicon (such as plates over 1.5 inches thick), limit the maximum silicon content to 0.21 percent and the phosphorous content to 0.03 percent.
- B. Unless otherwise indicated, meet the following requirements: (Note: Steel Sheet pile shall be per Section 31 41 17, SSP Bulkhead.)

<u>Item</u>	<u>ASTM Reference</u>
Steel Shapes and Plates	A6, A572, Grade 50 or A992, Grade 50
Steel Pipe	ASTM A572, Grade 50

<b>Item</b>	<b>ASTM Reference</b>
Structural Steel Tubing	A6, A500, Grade B
Stainless Steel:	
Bars and Angles	A276, AISI Type 316 (316L for welded connections)
Shapes	A276, AISI Type 304 (304L for welded connections)
Steel Plate, Sheet, and Strip	A240/A240M, AISI Type 316 (316L for welded connections)
Bolts, Threaded Rods, Anchor Bolts, and Anchor Studs (not used as tie rods)	F593, AISI Type 316, Condition CW
Nuts	F594, AISI Type 316, Condition CW
Steel Bolts and Nuts:	
High-Strength	A325, Type 1 bolts, with A563 nuts
Anchor Bolts	F1554, Grade 55, with weldability Supplement S1
Flat and Beveled Washers (Hardened)	F436
Welded Anchor Studs	A108, Grades C-1010 through C-1020 A496, 70,000 psi yield strength
Welded Deformed Bar Anchors	
Cast Steel Deck Fittings	A27, Grade 65/35
Steel Sheet Piles	See Section 31 41 17

## 2.02 ANCHOR BOLTS

### A. Cast-in-Place Anchor Bolts:

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown or specified.

## 2.03 CONCRETE DRILLED ANCHORS

### A. General:

1. AISI Type 316 stainless or hot-dip galvanized, as shown in Fastener Schedule at end of this section.
2. Current evaluation and acceptance reports by ICC (Report #ESR-2322 and ICC-ES Acceptance Criteria AC 308), or other similar code organization.

B. Adhesive Anchors:

1. Threaded Rod:
  - a. ASTM F593 stainless steel threaded rod, diameter as shown on Drawings.
  - b. Length as required, to provide minimum depth of embedment.
  - c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
  - a. Two-component, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
  - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
  - c. Nonsag, with selected viscosity base on installation temperature and overhead application where applicable.
3. Packaging and Storage:
  - a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
  - b. Store adhesive cartridges on pallets or shelving in covered storage area, in accordance with manufacturer's written instructions.
  - c. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date.
  - d. Dispose of cartridges if shelf life has expired.
4. Approved Manufacturer and Product:
  - a. Hilti, Inc., Tulsa, OK; HIT RE 500-SD Adhesive Anchor System.
  - b. Or Engineer-approved equal.

2.04 SOURCE QUALITY CONTROL

- A. Contractor shall retain the services of a qualified engineering testing agency, CWI, and Special Inspector, to provide source and field quality control services, in accordance with Section 05 05 13, Welding.
- B. Visually inspect all fabrication welds and correct any deficiencies.
  1. Steel: AWS D1.1, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.
  2. Stainless Steel: AWS D1.6.
- C. Hot-Dip Galvanizing:

1. An independent testing agency will be retained by Contractor to inspect and test hot-dip galvanized fabricated items in accordance with ASTM A123 and ASTM A153.
  2. Visually inspect and test for thickness and adhesion of zinc coating for minimum of three test samples from each lot in accordance with ASTM A123 and ASTM A153.
  3. Reject and retest nonconforming articles in accordance with ASTM A123 and ASTM A153.
- D. Contractors Inspector shall work in conjunction with the CWI, and in accordance with ICC-International Building Code, Sections 1704.3, 2204.1, and 2204.2.

## 2.05 FABRICATION

### A. General:

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to Site.

### B. Materials:

1. Use steel shapes, unless otherwise noted.
2. Steel to be hot-dip galvanized: Limit silicon content to less than 0.04 percent or to between 0.15 and 0.25 percent.

### C. Welding:

1. Welding shall be in accordance with Section 05 05 23, Welding.
2. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
3. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
4. Steel: Meet fabrication requirements of AWS D1.1, Section 5.
5. Aluminum: Meet requirements of AWS D1.2.
6. Stainless Steel: Meet requirements of AWS D1.6.
7. Welded Anchor Studs and Deformed Bar Anchors: Prepare surface to be welded and weld with stud welding gun in accordance with AWS D1.1, Section 7, and manufacturer's instructions.

8. Complete welding before applying finish.

D. Painting:

1. Shop prime with rust-inhibitive primer as specified, unless otherwise indicated.
2. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified, unless indicated otherwise.
3. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.

E. Galvanizing:

1. Fabricate steel to be galvanized in accordance with ASTM A143, ASTM A384, and ASTM A385. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Provide venting and drain holes for tubular members and fabricated assemblies in accordance with ASTM A385.
3. Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
4. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
5. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123/A123M.
6. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153/A153M. Oversize holes to allow for zinc alloy growth. Shop assemble bolts and nuts.
7. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION OF METAL FABRICATIONS**

- A. Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.
- B. Install rigid, substantial, and neat in appearance.
- C. Install manufactured products in accordance with manufacturer's recommendations.
- D. Obtain Engineer approval prior to field cutting steel members or making adjustments not scheduled.

## 3.02 CONCRETE DRILLED ANCHORS

- A. Begin installation only after concrete to receive anchors has attained design strength.
- B. Install in accordance with manufacturer's instructions.
- C. Provide minimum embedment, edge distance, and spacing as follows, unless indicated otherwise by anchor manufacturer's instructions or shown otherwise on Drawings:

<b>Anchor Type</b>	<b>Min. Embedment (bolt diameters)</b>	<b>Min. Edge Distance (bolt diameters)</b>	<b>Min. Spacing (bolt diameters)</b>
Adhesive	12	9	13.5

- D. Use only drill type and bit type and diameter recommended by anchor manufacturer. Clean hole of debris and dust with brush and compressed air.
- E. For undercut anchors, use special undercutting drill bit and rotary hammer drill and apply final torque as recommended by anchor manufacturer.
- F. When embedded steel or rebar is encountered in the drill path, slant drill to clear obstruction. If drill must be slanted more than 10 degrees to clear obstruction, notify Engineer for direction on how to proceed.
- G. Adhesive Anchors:
  - 1. Do not install adhesive anchors when temperature of concrete is below 40 degF or above 100 degF.
  - 2. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry where required by manufacturer's instructions.
  - 3. Do not disturb anchor during recommended curing time.
  - 4. Do not exceed maximum torque as specified in manufacturer's instructions.
- H. Drilled-in adhesive anchor installations shall be subject to periodic special inspections, by Contractor retained Special Inspector Services, in conformance with ICC-ES Report #ESR-2322, latest issue, and ICC-ES Acceptance Criteria AC308.

## 3.03 ELECTROLYTIC PROTECTION

- A. Galvanized Steel:
  - 1. Coat surfaces of galvanized steel fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals, as specified in

Section 09 97 13, Coating of Steel Waterfront Structures, unless indicated otherwise.

2. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.
3. Allow coating to dry before installation of the material.
4. Protect coated surfaces during installation.
5. Should coating become marred, prepare and touch up in accordance with paint manufacturer's written instructions.

B. Stainless Steel:

1. During handling and installation, take necessary precautions to prevent carbon impregnation of stainless steel members.
2. After installation, visually inspect stainless steel surfaces for evidence of iron rust, oil, paint, and other forms of contamination.
3. Remove contamination in accordance with requirements of ASTM A380 and ASTM A967.
4. Brushes used to remove foreign substances shall utilize only stainless steel or nonmetallic bristles.
5. After treatment, visually inspect surfaces for compliance.

3.04 PAINTING AND REPAIR OF GALVANIZED STEEL

A. Painted Galvanized Surfaces: Not required.

B. Repair of Damaged Hot-Dip Galvanized Coating:

1. Conform to ASTM A780.
2. For minor repairs at abraded areas, use sprayed zinc conforming to ASTM A780.
3. For flame cut or welded areas, use zinc-based solder, or zinc sticks, conforming to ASTM A780.
4. Use magnetic gauge to determine that thickness is equal to or greater than the base galvanized coating.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall retain the services of a qualified engineering testing agency, CWI, and Special Inspector, to provide source and field quality control services, in accordance with Section 05 05 13, Welding.

3.06 MANUFACTURER'S SERVICES

- A. Adhesive Anchors: Conduct site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Engineer of time and place for sessions.

## 3.07 FASTENER SCHEDULE

A. Unless indicated otherwise on the Drawings, provide fasteners as follows:

<b>Service Use and Location</b>	<b>Product</b>	<b>Remarks</b>
<b>1. Anchor Bolts Cast Into Concrete for Metal Fabrications and Castings</b>		
Exterior Wet Areas	Hot-dip galvanized headed anchor bolts.	
Submerged and Corrosive Areas	Stainless steel headed anchor bolts	
<b>2. Anchor Bolts Cast Into Concrete for Fenders</b>		
Submerged, Exterior, Wet, and Corrosive Areas	Stainless steel headed anchor bolts and U-bolts	
<b>3. Drilled Anchors for Metal Components to Cast-in-Place Concrete</b>		
Submerged, Exterior, Wet, and Corrosive Areas	Adhesive stainless steel anchors	
<b>4. All Others</b>		
Exterior Wet and Dry Areas	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on all stainless steel threads.

**END OF SECTION**

439197/WPB

METAL FABRICATIONS  
05 50 00 - 12

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 09 97 13**  
**COATING OF STEEL WATERFRONT STRUCTURES**

**PART 1 GENERAL**

1.01 REFERENCES

- A. 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.
1. ASTM International (ASTM):
    - a. ASTM D 7091, (2005) Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nondestructive Coatings Applied to Non-Ferrous Metals.
    - b. ASTM E 376, (2006) Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.
  2. The Society For Protective Coatings (SSPC):
    - a. SSPC PS 11.01, (1982; E 2004) Black (or Dark Red) Coal Tar Epoxy Polyamide Painting System.
    - b. SSPC Paint 16, (2006) Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint.
    - c. SSPC SP 1, (1982; E 2004) Solvent Cleaning.
    - d. SSPC SP 10/NACE No. 2, (2007) Near-White Blast Cleaning.

1.02 SUBMITTALS

- A. Approval is required for submittals, prior to commencement of construction. The following shall be submitted in accordance with Section 01 33 00, Submittal Procedures:
1. Certificates
    - a. Coal tar epoxy-polyamide coating system.
  2. Coating Inspector Qualifications
    - a. Resume providing detailed description of inspector's educational and work history.
    - b. Licenses and/or certificates.
    - c. Certified statement from the specific coating system manufacturer that is providing the coal tar epoxy-polyamide coating system materials for this project, stating the Contractor's proposed Coating Inspector is acceptable to the manufacturer.

1.03 ENVIRONMENTAL CONDITIONS

- A. Start work only when ambient and curing temperatures are within limits of coating manufacturer's recommendations and at least 5 degrees F above dew point temperature.

1.04 SAFETY AND HEALTH PRECAUTIONS

- A. Materials listed in this section contain coal tar pitch volatiles, which are toxic. Follow safety procedures as recommended by manufacturer. Work in a well ventilated area. Provide, and require workers to use, impervious clothing, gloves, face shields (8 inch minimum), and other appropriate protective clothing necessary to prevent eye and skin contact with coating materials. Keep coatings away from heat, sparks and flame.

1.05 HANDLING OF COATED MATERIAL

- A. Coating material shall be handled carefully with slings that will not mar the coating. All areas marred in handling, shipping, and at lay-down area shall be recoated as soon as possible after they are discovered, using the techniques set out in this specification and as recommended by the coating supplier.
- B. Coated pieces shall be shipped and stored with padded dunnage separating pieces and with pads under tie down chains or straps.
- C. No markings shall be made on members with lead based paints, grease crayon or other material that is incompatible with the coating. If marking is necessary, use a coal-tar enamel or stamp markings.
- D. Surfaces coated with coal-tar epoxy shall not be immersed in water until the coating has cured for at least 72 hours. Piling coated with coal-tar epoxy shall not be driven until the coating has cured for at least one week.

1.06 QUALITY ASSURANCE

- A. Coating System Inspector
  - 1. Contractor shall retain the services of an experienced and qualified coating system inspector, with specific experience and knowledge of the required surface preparation, the required coating procedures, mixing, and the required coating application processes for the coal tar epoxy-polyamide coating system specified herein.
  - 2. Coating System Inspector shall be on-site at the coating facility at all times steel items for this specific project are being prepared or coated. The Inspector shall provide visual inspection and NDT of coating thickness.

3. Coat System Inspector shall be responsible for approving all surface preparation tasks and that the specified near white blast finish and surface profile is provided, prior to allowing the coating to be applied. Inspector shall sign-off on each and that lot of steel product's surface preparation.
4. Coating System Inspector shall observe and check the coating mixing procedures, to insure the coating system mixture complies with the coating system manufacturer's specifications, prior to allowing the coating to be applied. Inspector shall sign-off on each batch of coating mix.
5. Coating System Inspector shall observe the complete three-coat application of the coal tar epoxy-polyamide coating system, making sure the correct temperature limits are met, the application of the coating is proper and complete, and the dry film thickness of each of the three coats meets or exceed the specified minimum DFT thicknesses.

## **PART 2 PRODUCTS**

### **2.01 COATING SYSTEMS**

- A. Coating: Provide catalyst components for coatings specific for resin components. Use thinners which are compatible with the coating.
  1. Coal Tar Epoxy-Polyamide:
    - a. System: SSPC PS 11.01.
    - b. Paints: SSPC Paint 16 Black (second coat) and Dark Red (first coat).
- B. Approved Products and Manufacturer.
  1. Coal Tar Epoxy-Polyamide: High build, polyamide epoxy coal-tar coating system, with a minimum weight of solids of 82 percent, plus-or-minus 2 percent, mixed. Provide catalyst components for coatings specific for resin components. Use thinners which are compatible with the coating. "TARGUARD, Coal Tar Epoxy", as manufactured by Sherwin Williams is an approved product.
  2. Epoxy Polyamide Primer: Specifically formulated for immersion service under immersion grade epoxies and polyurea, with a minimum weight of solids of 85 percent, plus-or-minus 2 percent, mixed. "COPOXY Shop Primer", as manufactured by Sherwin Williams is an approved product.

## **PART 3 EXECUTION**

### **3.01 CLEANING AND PREPARATION OF SURFACES**

- A. Solvent Cleaning: SSPC SP 1. Remove visible oil, grease, and drawing and cutting compounds by solvent cleaning.

- B. Blast Cleaning: SSPC SP 10/NACE No. 2. After solvent cleaning, complete surface preparation by near-white blast cleaning. Remove residual dust from blasted surface by blowing with dry, oil-free air, vacuuming, or sweeping. Provide surface profile of at least 2 1/2-mil thickness.

### 3.02 PROPORTIONING AND MIXING OF COATING SYSTEM

- A. Proportioning of Coal Tar Epoxy-Polyamide System: Coal tar epoxy-polyamide consists of a two-component system. Component A contains a refined coal tar pitch, polyamide resin, and a polyamine promoter to accelerate curing rate. Component B is an epoxy resin. Mix both components in a ratio of 4 parts of Component A to 1 part of Component B by volume.
- B. Thinning: Do not thin coatings when doing so will result in total volatile organic compounds exceeding limits enacted by local air pollution control districts. When thinning is allowed and is necessary for proper application, use xylene or the coating manufacturer's recommended thinner, to a maximum of 1/2 gallon to a 5-gallon batch.
- C. Mixing of Coal Tar Epoxy-Polyamide System: Power stir components to a smooth, uniform consistency. Stir coating periodically during induction period. Follow coating manufacturer's requirements for induction time and pot life of mixed batches.

### 3.03 COATING SYSTEM APPLICATION

- A. Apply epoxy polyamide primer coating to dry surfaces not more than 4 hours after near-white blast cleaning. Apply one coat at the rate of 3.0 to 5.0 mils DFT, so that finished surfaces are free from runs, sags, brush marks and variations in color.
- B. Apply two coats of coal tar epoxy-polyamide at a dry film thickness of not less than 8.0 to 12.0 mils DFT each coat. First coat shall be red and second coat shall be black. Provide a total coating system minimum dry film thickness (DFT) of at least 20.0 mils and not more than 29.0 mils. Measure using a magnetic gage.
- C. Unless otherwise specified by manufacturer's recommendations, do not allow drying time between coats to exceed 72 hours. Under conditions of direct sunlight or elevated ambient temperatures, limit intercoat drying period to that recommended by the coating system manufacturer.
- D. Repair detected coating holidays, thin areas, and exposed areas damaged prior to or during installation by surface treatment and application of additional coating or by manufacturer's recommendations. Allow a period of at least 72 hours to pass following final coat before placing in immersion service.

### 3.04 SURFACES TO BE COATED

#### A. Steel Waterfront Construction:

1. Front and back surfaces of bulkhead steel sheet piles from top of sheets to 5-feet below the mudline.

### 3.05 TOUCH-UP AND REPAIR OF DAMAGE

- A. Where a new coat shall overlap an existing coat, the existing coat shall be prepared in accordance with the Steel Structures Painting Council Surface Preparation Specification No. 7 Brush-Off Blasts Cleaning, prior to applying the new coat.
- B. After steel piles have been driven, all scratches, scars, abrasions and other damage shall be blast cleaned and touched-up.

### 3.06 FIELD TESTS

- A. Conduct testing in presence of the Owner's Representative.
- B. Holiday Testing:
  1. Prior to installation, test for holidays in total coating system. Use a low-voltage holiday detector of less than 90 volts in accordance with manufacturer's instructions.
  2. After repair of holidays by surface treatment and application of additional coating or by manufacturer's recommended repair method, retest with a low-voltage holiday detector.
- C. Dry Film Thickness:
  1. After repair of holidays, measure dry film thickness using a magnetic dry film thickness gage in accordance with ASTM D 7091 and ASTM E 376.
  2. Re-measure after an additional coat is applied, and add it to meet minimum thickness requirements.

**END OF SECTION**



**SECTION 31 23 23  
EARTHWORK**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Preparation of subgrade (Base and Subbase) for pavement and pavers.
- B. Excavation for Electrical Work, Utilities and drainage pipes: Excavation and backfill required in conjunction with underground mechanical and electrical utilities buried mechanical and electrical appurtenances, site utilities and drainage pipes.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork and site grading in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: Employ, at Contractor's expense, an independent testing and inspection laboratory acceptable to Engineer to perform survey for offsite satisfactory soil materials, including sampling and testing of soil materials and to provide field testing facilities for quality control testing during earthwork and site grading operations. A Certified Soils Lab and Engineer shall be retained by the Contractor to direct and monitor all backfilling and compaction procedures, as well as furnish a final certification (by Registered Engineer) letter to the Engineer that all backfill has been properly placed and compacted. This includes all compaction to finished grade, as well as all asphalt paving and stabilized subgrade work.
- C. Tests for Proposed Soil Materials: Test soil materials proposed for use in work and promptly submit test result reports.
- D. Provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade and fills. Determine maximum densities in accordance with ASTM D1557 (AASHTO T180). Testing service shall determine suitability of materials to be used as fill.

1.03 SUBMITTALS

- A. Test Reports: Submit copies of following reports directly to Engineer. All test reports must be signed by a licensed Professional Engineer.
  - 1. Field density test reports.

2. One optimum moisture-maximum density curve for each type of soil encountered.
3. Other tests and materials certificates as required.

#### 1.04 JOB CONDITIONS

- A. **Site Information:** Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
- B. **Existing Utilities:** Locate existing underground utilities in areas of work before starting earthwork operations. Where utilities to remain in place, provide adequate means of protection during earthwork operations.
  1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner, and public and private utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided. Provide minimum of 72-hour notice of proposed interruption to Engineer.
  3. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
- C. **Use of Explosives:** Use of explosives is not permitted.
- D. **Temporary Protection:** Barricade open excavations made as part of earthwork operations and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction. Protect new and existing structures, utilities, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

## **PART 2 PRODUCTS**

### 2.01 DEFINITIONS

- A. Satisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GW, GP, GM, SM, SW and SP.

- B. Unsatisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.
- C. Satisfactory soil materials are defined as those complying with the American Association of State Highway and Transportation Officials (AASHTO) Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.
- D. Unsatisfactory soil materials are defined as those described in AASHTO M145 for soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also, peat and other highly organic soils.
- E. Cohesionless Soil Materials: Include gravels, sand-gravel mixtures, sands and gravelly-sands.
- F. Cohesive Soil Materials: Include clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

## 2.02 SOIL MATERIALS

- A. Backfill and Fill Materials: Use satisfactory soil materials for backfill and fill, free of rock or gravel larger than 2 inches in any dimension, debris, waste, vegetable, and other deleterious matter and complying with the above definitions. See Article 3.03.A.
- B. Pavement/Paver Subbase Material: Properly graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or processed sand that will readily compact to required density. Use material complying with AASHTO M147, Grade A, unless otherwise indicated.
- C. Base Course Aggregate: FDOT Reclaimed Portland Cement Concrete Pavement crushed and processed per FDOT Section 901-5 or FDOT Limerock Material For Base Course and Stabilized Base per FDOT Sections 200 and 911. Provide material which meets FDOT Section 204 for graded aggregate base material for gradation and have an LBR value of not less than 100.

## PART 3 EXECUTION

### 3.01 EXCAVATION

- A. General: Excavation consists of removal and disposal of materials encountered when establishing required grade elevations.

- B. Excavation is Unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- C. Excavation Classifications: The following classifications of excavation will be made when rock excavation is encountered in the Work:
  - 1. Earth excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
  - 2. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42 inches wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90 HP flywheel power and 30,000 pound drawbar pull. Trenches in excess of 10 feet-0 inch in width and pits in excess of 30 feet-0 inch in either length or width are classified as open excavation.
  - 3. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170 HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).
  - 4. Typical of materials classified as rock are boulders 1/2 cubic yard or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
  - 5. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.
- D. Unauthorized excavation consists of removal of materials beyond indicated elevations or side dimensions without the specific direction of Engineer. Replace unauthorized excavation by backfilling and compacting as specified for authorized excavations of same classification, unless otherwise directed by Engineer. Cost of unauthorized excavation and remedial backfill shall be borne by Contractor.
- E. Dewatering: Use of dewatering is not permitted, where dewatering would be required at drainage structures bases below water table, the Contractor shall provide a minimum of 12 inches of limerock base below bottom of structure.

- F. Material Storage: Stockpile excavated materials classified as satisfactory soil material where directed, until required for fill. Place stockpiled fill materials away from edges of excavation; grade, and shape stockpiles for proper drainage.
- G. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.
- H. Excavation for Trenches: Dig trenches to uniform width required for particular item to be installed, sufficiently wide to provide working room.
1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.
  2. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installing pipe.
  3. For pipes or conduit 5 inches or less in nominal size, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
  4. For pipes or conduit 6 inches or larger in nominal size, tanks and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6 inches below bottom of work to be supported.
  5. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is not less than 3 feet.-6 inches below finished grade.
  6. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
  7. For piping or conduit less than 2 feet-6 inches below surface of roadways, provide 4 in. thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4-inch thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.
  8. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
- I. Closing Abandoned Underground Utilities: Close open ends of abandoned underground utilities indicated to remain with sufficiently strong closure to withstand pressures which may result after closing.
1. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for type of material and size of pipe. Do not use wood plugs.
  2. Close open ends of concrete and masonry utilities with not less than 8 in thick brick masonry bulkheads, constructed to fill opening.

3. Lay brick in mortar, forming a full bed with ends and side joints in one operation and with maximum 3/8-inch wide joints. Protect fresh masonry from rapid drying and maintain protection until mortar has set.

J. See Article 3.08 for surplus material disposal locations.

### 3.02 COMPACTION

- A. General: Control all soil compaction during construction to provide 98 percent AASHTO T-180 of density specified for each area classification.
- B. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or to layer of soil material. Apply water in such manner as to prevent free water from appearing on surface during or subsequent to compaction operations.
- C. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  1. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to satisfactory value.

### 3.03 BACKFILL AND FILL

- A. General: In excavations, use satisfactory excavated or borrow material that has been sampled, tested and approved by soil testing agency. Obtain materials from an off-site (off Port/Campus property) location. Place in layers to required subgrade elevations indicated.
  1. Under walks and pavements/pavers, use subbase material, or excavated or borrow material, or combination of both.
  2. Under piping and conduit, provide subbase material where indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.
  3. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Flow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. Break-up the ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and specified percentage of relative density. After site clearance, the footprint of any proposed structures and pavement areas shall be compacted with a self-propelled roller

(Dynapac CA-15 or equivalent) until the subsoils achieve 98 percent of maximum dry density (ASTM D1557) to a depth of at least 12 inches below the stripped grade prior to adding backfill. The soil densification should encompass the entire footprint of the structures or the entire paved area, plus a 10 foot wide perimeter that extends beyond the maximum lines of the superstructures.

- C. Placement and Compaction: Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment (Roller Compactors with vibration), and not more than 4 inches loose depth for material compacted by hand-operated equipment (tamper and plate compactors).
- D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of soil material. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- E. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities, as required.

### 3.04 GRADING

- A. General: Uniformly grade areas within limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Pavements/Pavers: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape in line, grade, and cross-section as indicated.

### 3.05 PAVEMENT/PAVER SUBBASE COURSE

- A. General: Subbase course consists of placing subbase and base course material, in layers of specified thickness, over subgrade surface to support a pavement base course.

- B. Placing: Place Base course material on prepared and proof rolled subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase and base material during placement operations.
  - 1. When compacted subbase and base course is shown to be 6 inches thick or less, place material in single layer. When shown to be more than 6 inches thick, place subbase material in equal layers, except no single layer more than 6 in. or less than 3 inches in thickness when compacted.

### 3.06 FIELD QUALITY CONTROL

- A. Quality Control Testing during Construction: Contractor shall provide independent testing service to inspect and approve subgrades (subbase and base) and fill layers before further construction work is performed thereon.
  - 1. Perform field density tests in accordance with ANSI/ASTM D1556 (sand cone method), ANSI/ASTM D 2167 (rubber balloon method) or ASTM 2922 and ASTM 3017 (Nuclear Testing Method) as applicable. (This includes proof rolled insitu material).
  - 2. Make at least one field density test of subgrade for every 1,500 square foot of paved area, but in no case less than 3 tests.
  - 3. In each compacted fill layer, make one field density test for every 1,500 square foot of overlaying paved area, but in no case less than 3 tests.
- B. If, based on reports of testing service and inspection, subgrade or fills which have been placed are below specified density, additional compaction and testing will be required until satisfactory results are obtained. Results of density tests of soil-in-place will be considered satisfactory if averages of any 4 consecutive density tests which may be selected are in each instance equal to or greater than specified density, and if not more than 1 density test out of 5 has a value more than 2 percent below required density.

### 3.07 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.08 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove all waste materials, including satisfactory and unsatisfactory excavated material, asphalt, trash and debris, and legally dispose off the Owner's property.

**END OF SECTION**

439197/WPB

EARTHWORK  
31 23 23 - 10

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 31 41 17**  
**STEEL SHEET PILE BULKHEAD**

**PART 1      GENERAL**

**1.01      REFERENCES**

- A. 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.
1. ASTM International (ASTM):
    - a. A6, (2009) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
    - b. A108, (2008) Steel Bars, Carbon, Cold-Finished, Standard Quality.
    - c. A307, (2010) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
    - d. A325, (2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
    - e. A328/A328M, 2007 Steel Sheet Piling.
    - f. A563, (2007a) Carbon and Alloy Steel Nuts.
    - g. A572/A572M, (2007) High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
    - h. A615, (2009b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
    - i. A668, (2004, Reapproved 2009) Steel Forgings, Carbon and Alloy, for General Industrial Use.
    - j. A992/A992M, (2011) Steel for Structural Shapes for Use in Building Frames.
    - k. F436, (2010) Hardened Steel Washers.
  2. American Welding Society (AWS):
    - a. AWS D1.1/D1.1M, (2010) Structural Welding Code - Steel.
  3. Post Tensioning Institute (PTI):
    - a. PTI Recommendations for Prestressed Rock and Soil Anchors, 2004.

**1.02      SYSTEM DESCRIPTION**

- A. The Steel Sheet Pile (SSP) Bulkhead specified by this section is a proprietary AZ-steel sheet pile system, manufactured by ArcelorMittal, Parsippany, NJ (973-428-6100) and distributed by Skyline Steel Company, Inc. Parsippany, NJ (866-875-9546), or Engineer approved equal.

1.03 SUBMITTALS

- A. Approval is required for submittals, prior to commencing construction. Submit the following (1.03.B-F) in accordance with Section 01 33 00, Submittal Procedures.
- B. Submit description of proposed pile-driving equipment, including at a minimum:
  - 1. Make and model of pile-driving hammer, including capacity and rated energy, and hammer details.
  - 2. Weight of capblock assembly, cushion dimensions, type of cushion material and cushion stiffness, helmet, templates, and extracting punching, or drilling equipment.
  - 3. History of proposed pile-driving equipment installing similar sized piles in similar soils.
- C. Submit detailed fabrication and erection drawings, including at a minimum:
  - 1. Detailed SSP bulkhead layout drawings, indicating each standard AZ-steel sheet pile, each special fabricated section, each corner section, and showing quantity and length of each type; including tie rods, anchor walls, grouted soil anchors, fabricated wales, hardware, nuts, bolts, fittings, etc.
  - 2. Details of special fabricated sections, including complete dimensions and minimum section properties.
  - 3. Details of wales, wale splices, wale spacers, fixing bolts, nuts, hardened washers, and heavy plate washers.
  - 4. Details of tie rods, including couplers, sleeve nuts, double nuts and heavy plate washers at each end, PTI corrosion protection system for tie rods, or grouted soil anchors, as applicable.
  - 5. Headed and Deformed Bar Anchors.
  - 6. Details and dimensions of templates and other temporary guide structures for installing the bulkhead.
- D. Submit manufacturer's product data and material certification that AZ-steel sheet piles, fabricated wales, tie rods, PTI corrosion protection system for tie rods, grouted soil anchors, couplers, sleeve nuts and hardware meet the specified requirements.
  - 1. Material test reports shall meet the requirements of ASTM A 6/A 6M.
  - 2. Submit certification that surface preparation and protective coating have been applied in conformance with specifications.
- E. During pile driving submit records, including the following:

1. Name of project, AZ-steel sheet pile pair number.
2. Driven pile length.
3. Pile length after cut off (if required).
4. Top of pile elevation.
5. Toe of pile elevation.
6. Pile Driving Records:
  - a. Records of the completed pile driving operations. Include a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling.
  - b. Submit complete and accurate test and production pile driving records as specified, within 15 calendar days after completion of driving.

F. Statements:

1. Pile pulling method.
2. Provide details of the method for handling piling to prevent permanent deflection, distortion or damage to piling interlocks and epoxy coating system.
3. Material Certificates:
  - a. Submit for each shipment of AZ-steel sheet pile, certificates identified with specific lots prior to installing piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.
  - b. Submit certificates and statements of conformance and acceptability for turnbuckles and ultrasonic test results.
  - c. Submit mill certificates, with chemical composition and mechanical properties, and product cut-sheet data on headed anchor stud connectors.
  - d. Submit certificates of compliance for PTI corrosion protection system for tie rods. Refer to Section 31 68 13, Permanent Soil Anchors for specific requirements.
4. Pile Driving Equipment: Submit descriptions of pile driving equipment to be employed in the Work to the Engineer for approval. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet and templates.

#### 1.04 REQUIREMENTS

A. Basis of Bids:

1. Base Lump Sum Bid Price on Steel Sheet Pile (SSP) bulkhead, pile sections and lengths as indicated. No additional payment will be made

for withdrawn, damaged, rejected, or misplaced piles; for any portion of a pile remaining above the cut-off elevation; for backdriving; for cutting off piles, or for any cut-off lengths of piles.

2. Contractor and its SSP bulkhead and steel sheet pile manufacturer/fabricator shall design, layout and detail the required special fabricated sections and corners, so as to make the bulkhead layout conform to the overall dimensions, as indicated on the Drawings.

**B. Steel Sheet Pile (SSP) Bulkhead Manufacturer:**

1. SSP bulkhead layout is based on standard AZ-steel sheet piles, as manufactured by ArcelorMittal, 8 Woodhollow Road, Parsippany, NJ 07054 (973-428-6100), and distributed by Skyline Steel Company, Inc., 8 Woodhollow Road, Parsippany, NJ 07054 (866-875-9546).
2. Contractor, at its option, may provide a different type and manufacturer, as long as the SSP bulkhead system complies with all provisions of these specifications, and has at a minimum the same section properties per linear foot of bulkhead and thicknesses of material. Submit tabulated comparison of SSP bulkhead section properties for the specified ArcelorMittal and the Contractor-proposed systems. Piles shall be hot-rolled steel and shall have interlocks of similar geometry as the ArcelorMittal AZ-steel sheet piles.
  - a. The minimum web and flange thickness of the pile sections shall be 0.375-inch, and shall meet or exceed the thickness of the specified ArcelorMittal section specified in the plans.
3. Submit SSP bulkhead layout drawing showing detailed layout of all AZ-steel sheet piles, each special fabricated section, each corner section, tie rods, turnbuckles, couplers, anchor walls, deadmen anchors, grouted soil anchors if used, wall penetrations, etc.
4. Contractor and its SSP bulkhead system manufacturer/fabricator shall provide revised engineering designs for each bulkhead. The revised engineering designs shall include, but not be limited to, redesigning and resizing of each of the major structural components for each of the bulkheads, including:
  - a. AZ-steel sheet pile section proposed.
  - b. Special fabricated sections.
  - c. Corner sections.
  - d. Reinforced concrete bulkhead cap and encasement.
  - e. Steel tie-rods (minimum yield strength of 150 ksi), complete with couplers, heavy steel plate washers and heavy-duty nuts, PTI corrosion protection system for tie rods, and grouted soil anchors (minimum yield strength of 150 ksi).
  - f. Continuous AZ-steel sheet pile anchor-walls, including continuous double-channel wales and associated hardware.
5. Contractor and SSP bulkhead system manufacturer/fabricator shall submit design drawings and calculations, indicating the adequacy of the

above redesigned major structural components. Structural design calculations and drawings shall bear the embossed seal, original signature and date (in a color that is different than the reproduction, i.e., blue ink for blacklines and black ink for bluelines) of the State of Florida licensed geotechnical or structural engineer, who was in responsible charge for the preparation of the engineering redesign and drawings. Said Florida licensed structural engineer shall be the Delegated Engineer for the redesigned SSP bulkheads, in accordance with Chapter 471, F.S., and Chapter 61G-15, F.A.C., for the redesign of the SSP bulkhead systems.

#### 1.05 DELIVERY AND STORAGE

- A. Materials delivered to the site shall be new and undamaged and shall be accompanied by certified test reports. Provide the manufacturer's logo and mill identification mark on the sheet piling as required by the referenced specifications.
- B. Piles shall not have a camber or sweep in excess of the permitted mill tolerance and ASTM A6.
- C. Deliver AZ-steel sheet piles in pairs, achieved by the crimping of the interlocks.
- D. Store and handle piling in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks and coating; and to provide adequate support.
- E. Handle piling using handling holes or lifting devices. Handle long length piles with multiple lifting points and care to prevent damage. Handle epoxy coated piling with slings.
- F. Storage and handling of sheet piling should also facilitate required inspection activities and prevent damage to coatings and corrosion protection systems, prior to installation.
- G. Support piling on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be aligned in a vertical plane.
- H. Store and handle tie-rods, with PTI corrosion protection system, with multiple lifting points and supporting blocks to prevent damage.

#### 1.06 FIELD MARKING ELEVATIONS

- A. Provide elevation reference and mark each pile to permit determination of the pile tip and top elevations.

## **PART 2 PRODUCTS**

### **2.01 AZ-STEEL SHEET PILES, HZ-PILES AND H-PILES**

- A. AZ-steel sheet piles shall be manufactured of hot-rolled steel conforming to the following:
  - 1. AZ14-770 Steel Sheet Piles: ASTM A572, Grade 50, (50 ksi).
- B. Sheet piles and interlocks shall be coated as specified on Section 09 97 13, Coating of Steel Waterfront Structures.
- C. Interlocks of sheet piling shall be free-sliding, allowing a swing angle of at least 5 degrees when threaded and maintain continuous interlocking when installed. Welds of interlocking to SSP shall be trade in the shop and as indicated on Section 05 05 23, Welding.
- D. Piling, including corner sections, and special fabricated sections, shall be full-length sections to the dimensions shown, or as required to complete the bulkhead to the overall dimensions indicated.
- E. Fabricated sections shall conform to the requirements herein and the piling manufacturer's recommendations for fabricated sections. Fabricated corners, tees and cross pieces shall be fabricated of piling sections with a minimum thickness of 1/2-inch.
- F. Provide piling with standard pulling holes.

### **2.02 WALES, WALE SPLICE PLATES AND PLATE WASHERS**

- A. Structural steel shapes and plates are designed based on a minimum 50 ksi yield strength. Provide shapes and plates in conformance with one of the following:
  - 1. ASTM A572, Grade 50 (50 ksi).
  - 2. ASTM A992, Grade 50 (50 ksi).

### **2.03 GROUTED SOIL ANCHORS AND TIE RODS**

- A. Grouted Soil Anchors: Provide grouted soil anchors in accordance with Section 31 68 13, Permanent Soil Anchors.
- B. High Strength Tie Rods:

1. All-thread bar tie rods shall conform to ASTM A722, A772M, with 150 ksi yield strength. Refer to Section 31 68 13, Permanent Soil Anchors, Paragraph 2.01 Rods.
2. High strength bars with rolled threads, complete with compatible, high-strength heavy hex nuts, hardened washers, splicing couplers, and heavy duty plate washers.
3. Welded tie rod splices will not be permitted.
4. Contractor, at its option, may provide high-strength tie rods of a different type and manufacturer, as long as the tie rods comply with all of the provisions of these specifications, have at a minimum the same allowable tensile load capacity as the tie rods shown in the Contract Drawings, with a maximum yield strength of 150 ksi.
5. PTI Corrosion Protection System: Provide a complete coating or encasement to protect all parts of the system from corrosion. Corrosion protection shall as a minimum meet Class 1 Protection, Multiple Corrosion Protection III per PTI Manual (Post Tensioning Institute), Recommendations for Prestressed Rock and Soil Anchors, 2004), with a service design life of at least 50 years.
6. Flowable fill shall be installed and allowed to harden prior to stressing the tie rods.

#### 2.04 BACKFILL

- A. Install flowable fill to at least the base of the concrete cap and allow it to harden prior to stressing the soil anchors. After all of the tie backs are stressed and tested, the concrete cap can be poured, followed by completing backfilling behind the wall with flowable fill and the installation of the concrete pavement.

#### 2.05 TURNBUCKLES AND COUPLERS

- A. Conform to ASTM A668, heat-treated and ultrasonic tested.
- B. Manufactured to carry at least 133 percent of the tie rod tensile capacity.
- C. Turnbuckles and couplers shall be manufactured by the high-strength, all-thread bar tie rod manufacturer.
- D. Provide turnbuckles and couplers, as required, to splice tie rods and to take-up excess slack in tie rods.

#### 2.06 BOLTS AND NUTS

- A. Bolts shall conform to ASTM A325X.

- B. Nuts shall conform to ASTM A563, heavy hex head, to match ASTM A325X bolts.
- C. Washers shall conform to ASTM F436, plain carbon steel, hardened, to match ASTM A325X bolts.

#### 2.07 APPURTENANT METAL MATERIALS

- A. Provide metal plates, shapes, bolts, nuts and other appurtenant fabrication and installation materials conforming to manufacturer's standards and to the requirements specified in the respective sheet piling standards.

#### 2.08 SHOP PROTECTIVE COATING

- A. Apply to all steel sheet piles, wales, connection plates, nuts, bolts, washers, and accessories, exposed to earth and saltwater.
- B. Protective coating shall be applied in a controlled shop environment. Submit procedures and details in writing to the Engineer for approval, in accordance with Section 09 97 13.26, Coating of Steel Waterfront Structures.
- C. Provide a complete PTI Class 1, MCP III corrosion protection system to all high-strength all-thread-bar tie rods, as specified herein, and in Section 31 68 13, Permanent Soil Anchors. Refer to Drawing Number DS-301 for type of corrosion protection system to be provided for the all-thread-bar tie rods.

#### 2.09 CONCRETE CAP AND SHEET PILE ENCASEMENT

- A. Concrete, Forms and Reinforcement: Provide concrete, forms and reinforcement in accordance with Section 03 31 29, Cast-in-Place Concrete for Marine Structures.
- B. Surface Preparation: Remove all loose rust and mill scale, earth and other deleterious materials from the pile surfaces, which reduce or destroy bond with concrete.

#### 2.10 TESTS, INSPECTIONS, AND VERIFICATIONS

- A. Requirements for material tests, workmanship and other measures for quality assurance shall be provided in accordance with Section 05 50 13, Metal Fabrications, and as specified herein.
- B. Materials Tests:
  - 1. Perform materials tests conforming to the following requirements. Sheet piling and appurtenant materials shall be tested and certified by the

manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the site.

2. Testing of steel sheet piles for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of sheet piles shall meet the requirements of ASTM A 6/A 6M, ASTM A328, and ASTM A572, as applicable.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

#### **A. Pile Driving Records:**

1. Develop a form compiling pile driving records, which must be approved, by the Engineer for recording pile driving data. Compile and submit accurate records of the pile driving operations on the approved form in accordance with paragraph "Submittals".
2. Include in driving records for each pile:
  - a. date driven,
  - b. pile identification number,
  - c. cross section shape and pile dimensions,
  - d. location and deviations from design location,
  - e. original length,
  - f. ground elevation,
  - g. top elevation,
  - h. toe elevation,
  - i. description of hammer used,
  - j. number of blows required for each foot of penetration throughout the entire length of the pile and for each inch of penetration in the last foot of penetration,
  - k. total driving time in minutes and seconds, and
  - l. any other pertinent information as required or requested such as unusual driving conditions, interruptions or delays during driving, damage to pile resulting from driving, heave in adjacent piles, re-driving, weaving, obstructions, predrilling, prepunching, and depth and description of voids formed adjacent to the pile.
3. Additional data required to be recorded for impact hammers includes:
  - a. rate of hammer operation,
  - b. make and size of hammer, and
  - c. the length of the bounce hose.
4. Additional data required to be recorded for vibratory hammers includes:
  - a. hammer power pack description,
  - b. make and size,
  - c. horsepower applied to pile, and
  - d. hammer operating frequency.

- B. Pile Hammer: Use a pile hammer having a delivered force or energy suitable for the total weight of the pile and the character of subsurface materials to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy. Vibratory Hammer use is allowed (if feasible) but the final 2 feet to reach depth tip elevations shall be driven by diesel hammer to set the pile into the rock. During SSP vibratory and impact hammer install, Contractor shall monitor the existing site and adjacent structures, utilities and pavement to ensure damage to existing and new facilities does not take place. Contractor shall stop work and discuss with City should vibrations appear to be creating adverse and detrimental impacts to the site.
- C. Pile Protection: Use a protecting cap during driving to prevent damage to the top of the sheet piling. Provide toe protection if needed to penetrate hard driving into the weathered limestone strata.
- D. Templates:
  - 1. Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining SSP bulkhead piling in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the piling until design tip elevation is achieved.
  - 2. Templates shall not move when supporting piling. Fit templates with wood blocking to hold the piling at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the piling from warping or wandering from the alignment.
  - 3. Piling shall be carefully located as shown. Piling shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut-off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.
  - 4. Mark template for the location of the leading edge of each alternate sheet pile. If two guide marks cannot be seen, other means shall be used to keep the sheet pile vertical along its leading edge.
- E. Driving:
  - 1. Drive piling with the proper size hammer and by approved methods so as not to subject the piling to damage and to ensure proper interlocking throughout their lengths.

2. Maintain driving hammers in proper alignment during driving operations by use of leads or guides attached to the hammer.
3. Employ a protecting cap in driving when using impact hammers to prevent damage to the tops of piling. Remove and replace piling damaged during driving or driven out of interlock at the Contractor's expense.
4. Drive piling without the aid of a water jet.
5. Take adequate precautions to ensure that piling are driven plumb. Where possible, drive AZ-steel sheet piles with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet.
6. If at any time the forward or leading edge of the piling is found to be out-of-plumb in the plane of the wall the piling being driven shall be driven to the required depth and tapered piling shall be provided and driven to interlock with the out-of-plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1/8 inch per foot of length.
7. If hard driving or obstructions restrict driving a piling to the specified penetration, the obstructions shall be removed or penetrated with a chisel beam, a punch, a probe, or a drill. If the Contractor demonstrates that removal or penetration is impractical, make changes in the design alignment of the piling structure as directed by the Engineer, to ensure the adequacy and stability of the structure. Piling shall be driven to depths shown and shall extend up to the elevation indicated for the top of piling. A tolerance of 1 inch above the indicated top elevation will be permitted. Piling shall not be driven within 100 feet of concrete less than 7 days old.
  - a. Hard driving is defined as the point the pile reaches practical refusal prior to reaching the specified depth of penetration.
  - b. Sheet Pile Practical Refusal is defined as zero rate of penetration, while using a vibratory-hammer, for at least 10 seconds.
8. Pre-augering or spudding of piles will not be permitted.

F. Cutting-Off and Splicing:

1. Piles driven to refusal or the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance may be cut-off to the required elevation, only at the Engineer's direction.
2. Piles driven below the required top elevation and piles damaged by driving and cut-off to permit further driving shall be extended as required to reach the top elevation by splicing when directed by the Engineer, at no additional cost to the Owner.

3. If directed by the Engineer, splice piles as required to drive them to depths greater than shown on the drawings and extend them up to the required top elevation. Piles adjoining spliced piles shall be full length unless otherwise approved by the Engineer.
4. If splices are allowed in adjoining piles, the splices shall be spaced at least 10 feet apart in elevation.
5. Ends of piles to be spliced shall be squared before splicing to eliminate dips or camber. Splice piles with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks.
6. Spliced piles shall be free sliding and able to obtain the maximum swing with contiguous piles.
7. Trim the tops of piles excessively battered during driving, when directed at no cost to the Owner. Pile cut-offs shall become the property of the Contractor and shall be removed from the site.
8. Use a straight edge in cutting by burning to avoid abrupt nicks. Bolt holes shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for tie rods, reinforcement or other items to be inserted. Do not use explosives for cutting.
9. Weld splices in accordance with Section 05 05 23, Welding, Structural and Section 05 50 13 – Metal Fabrications. Shop and field welding, qualification of welding procedures, welders, and welding operators, and inspections by AWS Certified Welding Inspectors, shall be in accordance with AWS D1.1/D1.1M.

G. Tolerances in Driving:

1. Drive all piles with a variation from vertical of not more than 1/8 inch per foot, with a maximum deviation of not more than 6 inches from vertical alignment at any point.
2. Top of pile at elevation of cut-off shall be within +/-1/2 inch vertically of the elevation indicated.
3. Top of pile at elevation of cut-off shall be within +/-2 inches of alignment indicated.
4. Manipulation of piles to force them into position will not be permitted.
5. Check all piles for heave. Redrive all heaved piles to the required tip elevation.

H. Corrosion Protection: Provide SSP bulkhead coating system in accordance with Section 09 97 13, Coating of Steel Waterfront Structures.

I. PTI Corrosion Protection System: Provide all high-strength all-thread-bar tie rods with a PTI MCPIII, Class 1 Protection system, in accordance with Section 31 68 13, Permanent Soil Anchors and as specified herein.

### 3.02 INSPECTION

- A. Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Engineer and the Owner's Geotechnical Engineer.
- B. Inspection of Driven Piling:
  - 1. Contractor shall inspect the interlocks of the portion of driven piles that extend above ground.
  - 2. Contractor shall use divers to inspect the underwater portions of sheet piling interlocks should the question of piles out of interlock below water level be raised.
  - 3. Remove and replace piles found to be out of interlock, at no additional cost to the Owner.
- C. Pulling and Redriving:
  - 1. Contractor may be required to pull selected piles after driving to determine the condition of the underground portions of piles.
  - 2. Contractor shall be required to pull and redrive piles that do not meet specified tolerances.
  - 3. The pile pulling method must be approved by the Engineer.
  - 4. Remove and replace at the Contractor's expense any pile pulled and found to be damaged to the extent that its usefulness in the structure is impaired.
  - 5. Redrive piles pulled and found to be in satisfactory condition.
  - 6. Remove all damaged and out of tolerance piling from the Owner's site.

### 3.03 INSTALLATION RECORDS

- A. Maintain a pile driving record for AZ-steel sheet piles.
- B. Indicate on the installation record: dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations (x, y, & z), tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles.
- C. Record any unusual pile driving problems during driving.
- D. Submit complete driving records to the Engineer.

### **END OF SECTION**

439197/WPB

STEEL SHEET PILE BULKHEAD  
31 41 17 - 14

439197/WPB  
MAY 16, 2014  
©COPYRIGHT 2014 CH2M HILL

**SECTION 31 68 13**  
**PERMANENT SOIL ANCHORS**

**PART 1      GENERAL**

1.01      DESIGN AND PERFORMANCE REQUIREMENTS

- A. Contractor shall design, fabricate and install permanent grouted ground anchor system of high strength steel rods to restrain and control the displacement of structural bulkhead elements by developing vertical and lateral load carrying members which develop resisting forces by stressing the soil around the anchorage length. The system shall include, but not be limited to, the following elements:
1. Rods: High strength steel rods which include:
    - a. Bond Length: Where the rod is fixed in the primary grout bulb and transfers the tension force to the surrounding soil.
    - b. Free Length: An unbonded zone where the tendon is free to elongate elastically transferring the resisting force from the anchor bond length to the structural cap beam.
  2. Anchor grout mix design, including both primary and secondary mixes.
  3. Anchorage: Plates or anchor heads which permit stressing and lock-off of the prestressing steel.
  4. Corrosion Protection: Complete coating or encasement to protect all parts of the system from corrosion. Corrosion protection shall as a minimum meet Class I Protection, Multiple Corrosion Protection III per PTI Manual. (Post Tensioning Institute, Recommendations for Prestressed Rock and Soil Anchors, 2004).
  5. Service Design Life: Design permanent grouted ground anchor system to have a service life of 50 years.
- B. Design of anchorage system shall be provided by a Professional Geotechnical Engineer, licensed in the State of Florida.

1.02      QUALIFICATIONS

- A. Contractor performing the work described in this Specification shall have installed permanent grouted soil anchors for a minimum of 5 years. At the preconstruction conference, the Contractor shall submit a list containing at least five projects, completed within the last 3 years, where the Contractor has installed permanent grouted soil anchors. A brief description of each project and a reference shall be included for each project listed. As a minimum, the reference shall include an individual's name and current phone number.
- B. Prior to the start of work, Contractor shall submit a list identifying his engineer, drill operators and onsite supervisors who will be assigned to the Project. The list shall contain a summary of each individual's experience and it

shall be complete enough for the Engineer to determine whether or not each individual has satisfied the following qualifications.

- C. Contractor shall retain a Professional Geotechnical Engineer, licensed in the State of Florida, to supervise the work with at least 5 years of experience in the design and construction of permanent grouted anchor system structures. Contractor shall not use consultants or manufacturers' representatives in order to meet the requirements of this Section. Drill operators and onsite supervisors shall have a minimum of 5 years experience installing permanent grouted soil anchors with the Contractor's organization.
- D. The Engineer will approve or reject the Contractor's qualifications and staff within 15 working days after receipt of the submission. Work shall not be started on any soil anchor nor materials ordered until approval of the Contractor's qualifications. The Engineer may suspend the grouted soil anchor work, if the Contractor substitutes unqualified personnel for approved personnel during construction. If work is suspended due to the substitution of unqualified personnel, the Contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustment in contract time resulting from the suspension of work will be allowed.

### 1.03 SUBMITTALS

- A. Product Data: Manufacturers catalog data on each component of the system.
- B. Drawings: Provide design and fabrication drawings of grouted ground anchors including, but not limited to, layout of rods, sequencing of installation, angle of inclination, anchor length, bond length and minimum unbonded length. Include design data, design calculations and criteria pertinent to design of system. Drawings and calculations shall be signed and sealed by a Professional Geotechnical Engineer licensed by the State of Florida.
- C. Certificates of Compliance for all materials.
- D. Testing sequence, plan and methodology for each anchor following at a minimum, the requirements of Article 3.02 Submit with Item 1.03E.
- E. Contractor shall submit to the Engineer for review and approval or rejection, calibration data for each test jack, pressure gauge and reference pressure gauge to be used. Testing cannot commence until the Engineer has approved the jack, pressure gauge, reference pressure gauge calibrations and testing plan.
- F. Contractor shall submit to the Engineer within 20 calendar days after completion of the grouted soil anchor work a report containing at a minimum:
  - 1. Steel manufacturer's certified mill test reports for the high strength steel rods incorporated in the installation.

2. Grouting records indicating the cement type, quantity injected and the grout pressures; and
3. Grouted soil anchors certified load test results and graphs.

## **PART 2 PRODUCTS**

### **2.01 RODS**

- A. All-thread-bars: ASTM A722 continuous threaded steel bars, minimum 150 ksi, fabricated from high quality domestic material.
  1. Bar Size: Diameter as determined by design. Size so the tensile design load does not exceed 60 percent of the minimum specified ultimate tensile strength or the maximum test load does not exceed 80 percent of the minimum specified ultimate tensile strength of the rod. Provide bars in maximum single lengths possible.
  2. Finish: ASTM A153 hot-dip galvanized or ASTM A775 epoxy-coated.
  3. Centering Devices: Fabricate bars with plastic or steel spacing devices designed to hold the tie rod in the center of the borehole of the bonded length.
- B. Couplings for bar lengths over 40 feet, provide galvanized or epoxy-coated mechanical splicing couplings of internally threaded steel designed to develop 125 percent of the ultimate strength of the all-thread-bars.
- C. Rods shall be free of dirt, rust, or any other deleterious substance. The bond length shall be degreased. Rods shall be handled and protected, prior to installation, in such a manner as to avoid corrosion and physical damage thereto. Damage such as abrasion kinks, welds, and weld splatters, cuts, nicks, will impair the proper performance of the rod and shall be cause for rejection.

### **2.02 ANCHOR GROUT**

Primary Grout: Portland Cement based mixture with pozzolanic material, fluidifier, sand and water proportioned and mixed to produce a grout capable of being pumped, with a minimum ultimate compressive strength of 4,000 psi at 28 days.

1. Portland Cement: ASTM C150.
2. Pozzolan: Fly ash or other approved pozzolanic material conforming to ASTM C618, Type F.
3. Fluidifier: ASTM C937, except that expansion shall not exceed 4 percent.
4. Water: Fresh, clean, and potable.
5. Fine Aggregate: ASTM C33, hard, dense, durable, fine sand.

- B. Secondary Grout: Portland Cement based mixture designed to be injected into the drilled hole after stressing to provide corrosion protection for unsheathed tendons.
- C. Testing: Strength testing will not be required as system performance will be measured by proof-testing. The Owner may require grout cube testing if admixtures are used or irregularities occur in anchor testing. The grout shall attain a minimum cube strength of 3,400 psi within 7 days.

## 2.03 ANCHORAGE

- A. Steel Plate: ASTM A36 or ASTM A992, Grade 50, hot-dip galvanized.
- B. Nuts, Washers and Caps: Hardened, heavy hex head steel fasteners, spacers and similar accessories and appurtenances as required for a complete tie rod system.

## **PART 3 EXECUTION**

### 3.01 INSTALLATION

- A. Boreholes: Drill anchor holes by augering, precussion or conventional rotary drilling methods. Flush hole with air and/or water as required to remove loose material. Extend boreholes to the full design length and declination of each anchor. Drill boreholes such that the anchorage length is constructed to achieve required resistance and the free length is isolated from the surrounding soil. Slope of anchor shall be within 3 percent of the design inclination.
- B. Primary Grouting: Extend casing, if required by design, and tremie-grout the hole and casing full of the primary grout mixture. The grout shall be injected from the lowest point of the drill hole. The grout may be pumped through grout tubes, casing, hollow-stem-augers or drill rods. The grout can be placed before or after insertion of the rods. The quantity of the grout and the grout pressures shall be recorded. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing. The following data concerning the grouting operation shall be recorded:
  - 1. Type of Mixer.
  - 2. Water/cement ratio.
  - 3. Types of Admixtures: Fluidifier.
  - 4. Grout pressure.
  - 5. Type of cement.
  - 6. Strength Test Samples.
  - 7. Volume of first and second stage grout.

- C. Tie Rods: Insert rods to full design length. Verify that centering devices are in place for maintaining the tendon bar in the center of the borehole.
- D. Pressure grout the bond length and completely withdraw the casing over bond length.
- E. Install flowable fill to the bottom of the concrete cap.
- F. Stressing: After waler has been installed at least 12 feet beyond the anchor location, begin stressing the tie rods as required.
- G. Concrete Cap: Construct concrete cap beam as indicated in Drawings.
- H. Complete the installation of flowable fill and install concrete pavement.

### 3.02 FIELD QUALITY CONTROL

- A. Contractor shall provide anchor proof test load up to 133 percent of the designated design load, using remote load cell read out unit and a dual pressure gauge system. All anchors shall be proof tested.
- B. Testing (By Contractor):
  - 1. As soil anchors are installed to required resistance, begin testing performance. Performance load test the first two anchors and one of every ten anchors thereafter, as selected by the Engineer.
  - 2. Prior to the grouting of any additional soil anchors, the first two performance tests shall be completed. The purpose of these initial tests is to verify the Contractor's installation procedures and confirm adequate resistance for the design loads.
  - 3. All anchors shall be proof tested.
  - 4. One anchor, at the Engineer's discretion shall be performance, creep and proof tested.
  - 5. The results of each test shall be recorded on forms approved by the Engineer. The testing forms provided in the appendix of the AASHTO-AGC-ARTBA Joint Committee Task Force 27 Report are acceptable. A separate form shall be submitted for each test. The test results shall be submitted to the Engineer on a weekly basis within one week of testing.
  - 6. No load greater than 10 percent of the design load can be applied to the soil anchor prior to testing. The maximum test load shall not exceed 80 percent of the minimum specified ultimate tensile strength of the rod.
- C. The testing equipment shall consist of:
  - 1. A dial gauge or vernier scale capable of measuring to 0.001 inch shall be used to measure the ground anchor movement. The

movement-measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and it shall have adequate travel so the soil anchor movement can be measured without resetting the device.

2. A hydraulic jack and pump shall be used to apply the test load. The jack and a calibrated pressure gauge shall be used to measure the applied load. The jack and pressure gauge shall be calibrated by an independent firm as a unit. The calibration shall have been performed within 45 working days of the date submitted. Testing cannot commence until the Engineer has approved the calibration. The pressure gauge shall be graduated in 100 psi increments or less. The ram travel of the jack shall not be less than the theoretical elastic elongation of the total anchor length at the maximum test load.
3. Contractor shall furnish Engineer with a calibrated reference pressure gauge to be kept at the site in possession of the Engineer. The reference gauge shall be calibrated with the test jack and pressure gauge.
4. Contractor shall provide an electrical resistance load cell and readout to be used when performing a creep test.
5. The stressing equipment shall be placed over the soil anchor in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

D. Performance Test: The load shall be raised from one increment to another immediately after recording the soil anchor movement. The soil anchor movement shall be measured and recorded to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. The load shall be monitored with a pressure gauge. The reference pressure gauge shall be placed in series with the pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the pressure gauge differ by more than 10 percent, the jack, pressure gauge and reference pressure gauge shall be recalibrated at no expense to the Owner. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

1. The performance test shall be made by incrementally loading and unloading the soil anchor in accordance with the following schedule:

PERFORMANCE TEST SCHEDULE

<u>Load</u>	<u>Load</u>
AL	AL
0.25DL*	0.25DL
AL	0.50DL
0.25DL	0.75DL

## PERFORMANCE TEST SCHEDULE

<u>Load</u>	<u>Load</u>
0.50DL*	1.00DL
AL	1.20DL*
0.25DL	AL
0.50DL	0.25DL
0.75DL*	0.50DL
AL	0.75DL
0.25DL	1.00DL
0.50DL	1.20DL
0.75DL	1.33DL*
1.00DL*	Reduce to lock-off load

Where: AL - is the alignment load.  
DL - is the soil anchor design load.

2. The maximum test load in a performance test shall be held for at least 10 minutes. The jack shall be repumped as necessary in order to maintain a constant load. The load-hold per rod shall start as soon as the maximum test load is applied and the soil anchor movement, with respect to a fixed reference, shall be measured and recorded at 1 minute, 2, 3, 4, 5, 6 and 10 minutes. If the soil anchor movement between 1 minute and 10 minutes exceeds 0.04 inch, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the soil anchor movement shall be recorded at 15 minutes, 20, 25, 30, 45 and 60 minutes.
3. Contractor shall plot the soil anchor movement versus load for each load increment marked with an asterisk (\*) in the performance test schedule and plot the residual movement of the tendon at each alignment load versus the highest previously applied load.

E. Proof Test: The load shall be raised from one increment to another immediately after recording the soil anchor movement. The soil anchor movement shall be measured and recorded to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. The load shall be monitored with a pressure gauge. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

1. The maximum test load in a proof test shall be held for at least 10 minutes. The jack shall be repumped as necessary in order to maintain a constant load. The load-hold period shall start as soon as the maximum test load is applied and the prestressed soil anchor movement, with respect to an independent fixed reference, shall be measured and

recorded at 1 minute, 2, 3, 4, 5, 6 and 10 minutes. If the soil anchor movement between one minute and ten minutes exceeds 0.04 inch, the maximum test load shall be held for an additional 50 minutes. If the load-hold is extended, the soil anchor movements shall be recorded at 15 minutes, 20, 25, 30, 45 and 60 minutes.

2. The proof test shall be performed by incrementally loading the soil anchor in accordance with the following schedule:

PROOF TEST SCHEDULE

<u>Load</u>	<u>Load</u>
AL	1.00DL
0.25DL	1.20DL
0.50DL	1.33DL
0.75DL	Reduce to lock off load

Where: AL - is the alignment load.  
DL - is the soil anchor design load.

3. The proof test results will be compared to the performance test results. Any significant variation from the performance test results warrants making a performance test on the next anchor.
4. Contractor shall plot the soil anchor movement versus load for each load increment in the proof test.

F. Creep Test: The Engineer will determine those soil anchors to be creep tested.

1. The creep test shall be made by incrementally loading and unloading the soil anchor in accordance with the performance test schedule given above. At the end of each loading cycle, the load shall be held constant for the observation period indicated in the creep test schedule below. The times for reading and recording the soil anchor movement during each observation period shall be 1 minute, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 45, 60, 75, 90, 100, 120, 150, 180, 210, 240, 270 and 300 minutes as appropriate. Each load-hold period shall start as soon as the test load is applied. In a creep test, the pressure gauge and reference pressure gauge will be used to measure the applied load and the load cell will be used to monitor small changes in load during a constant load-hold period. The jack shall be repumped as necessary in order to maintain a constant load.
2. Contractor shall plot the soil anchor movement and the residual movement measured in a creep test as described for the performance test above. Contractor shall also plot the creep movement for each load-hold as a function of the logarithm of time.

## CREEP TEST SCHEDULE

Load	Observation Period (min.)
AL	
0.25DL	10
0.50DL	30
0.75DL	30
1.00DL	45
1.20DL	60
1.33DL	300

- G. Lockoff: Upon satisfactory completion of all testing, the load shall be reduced to the lockoff load and transferred to the anchorage device. After transferring the load and prior to removing the jack, a lift-off reading shall be made. The lift-off reading shall be within 10 percent of the specified lock-off load. If the load is not within 10 percent of the specified lock-off load, the anchorage shall be reset and another lift-off reading shall be made. This process shall be repeated until the desired lock-off load is obtained. All anchors not tested shall be stressed to the required lockoff load.
- H. Cutting of Anchor Rod Protrusions: After an anchor has been accepted by the Engineer the portion of the anchor rod extending beyond the anchorage shall be saw cut and removed. Care shall be taken not to damage the rod or the anchorage.
- I. Soil Anchor Load Test Acceptance Criteria:
1. A performance or proof-tested soil anchor with a 10 minute load hold is acceptable if the:
    - a. Soil anchor carries the maximum test load with less than 0.04 inch of movement between 1 minute and 10 minutes; and
    - b. Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.
  2. A performance or proof-tested soil anchor with a 60 minute load hold is acceptable if the:
    - a. Soil anchor carries the maximum test load with a creep rate that does not exceed 0.08 inch/log cycle of time; and
    - b. Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.
  3. A creep tested soil anchor is acceptable if the:
    - a. Prestressed soil anchor carries the maximum test load with a creep rate that does not exceed 0.08 inch/log cycle of time; and
    - b. Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.
  4. If the total movement of the soil anchors at the maximum test load does not exceed 80 percent of the theoretical elastic elongation of the

- unbonded length, the Contractor shall replace the prestressed soil anchor at no additional cost to the Owner.
5. Soil anchors which have a creep rate greater than 0.08 inch/log cycle of time can be incorporated in the finished work at a load equal to one-half its failure load. The failure load is the load carried by the soil anchor after the load has been allowed to stabilize for 10 minutes.
  6. When a soil anchor does not satisfy the load test acceptance criteria, the Contractor may modify the design and/or the construction procedures. These modifications may include, but are not limited to; installing replacement soil anchors, reducing the design load by increasing the number of soil anchors, modifying the installation methods, increasing the bond length or changing the soil anchor type. Any modification which requires changes to the structure must have prior approval by the Engineer. Any modifications shall be performed at no additional cost to the Owner. No additional contract time shall be allowed for modifications. Retesting of the failed soil anchor shall not be allowed.
- J. If creep tests fail or Engineer feels that the system was otherwise not acceptable, abandon anchor systems and start all over with redesign and installation of new anchor system.

**END OF SECTION**

**PART 4 – REFERENCE DOCUMENTS****PART 1 GENERAL****1.01 SOIL INVESTIGATION DATA**

- A. Investigation: An investigation of subsurface soil conditions and of underwater inspection at the site was authorized by the Owner. These investigation reports are provided “for reference only” and shall not be construed as part of the Contract Documents. The report and boring logs and are provided to the Contractor “For Information Only” and are not a warranty or the accuracy of subsurface or site conditions.
1. Report of Geotechnical Exploration – Zero Duval Seawall – Nutting Engineers, Miami, Florida, dated February 2012, Report No. 126-21.2.
  2. Duval Street Seawall Inspection Report by G.M. Selby, WC of Miami, Florida, dated October 2008.
- B. Interpretation:
1. The Contractor is expected to examine the site and the above reports and then decide for himself the character of the materials to be encountered.
  2. The Owner and Engineer disclaim any responsibility for the accuracy, true location and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretation of the data by the Contractor, as in its projection of soil-bearing values, soil profiles, soil stability, and the presence, level and extent of underground water.

**1.02 PERMITS**

- A. Permits: Environmental Permits have been received by the Owner. These permits are provided for Contractor use. Contractor shall provide all requirements of permit and adhere to the requirements of each.
1. Florida Department of Environmental Protection, Environmental Resource Permit, Permit Number 44-0300867-002, dated September 24, 2013.
  2. Department of the Army Permit, Permit Number SAJ-2013-01387 NW-IF, dated November 21, 2013.
- B. Interpretation:
1. The Contractor is expected to examine the site and the above reports and then decide for himself the means and methods required to conduct all work including permit requirements.

2. The Owner and Engineer disclaim any responsibility for the accuracy, true location and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretation of the data by the Contractor, as in its projection of soil-bearing values, soil profiles, soil stability, and the presence, level and extent of underground water.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION**

3.01 SUPPLEMENTS

- A. The supplements listed below, following “End of Section”, is part of this Specification.
  1. See reports listed in Article 1.01.A, above.

**END OF SECTION**

**REPORT OF  
GEOTECHNICAL EXPLORATION**

**ZERO DUVAL SEAWALL  
TERMINUS OF DUVAL STREET  
KEY WEST, FLORIDA**

**FOR**

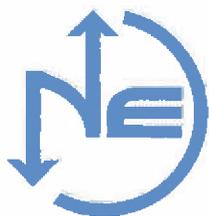
**CH2M HILL  
6410 5<sup>TH</sup> STREET, SUITE 2A  
KEY WEST, FLORIDA 33040**

**PREPARED BY**

**NUTTING ENGINEERS OF FLORIDA, INC.  
2051 NW 112<sup>TH</sup> AVE, SUITE 126  
MIAMI, FLORIDA 33072**

**ORDER NO. 126.21.2**

**FEBRUARY 2012**



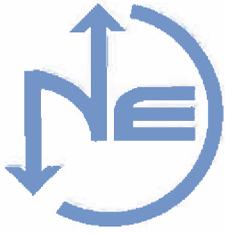
**Nutting  
Engineers**  
of Florida Inc. | Established 1967  
*Your Project is Our Commitment*

*Geotechnical & Construction Materials  
Engineering, Testing & Inspection  
Environmental Services*

*Offices throughout the state of Florida*

[www.nuttingengineers.com](http://www.nuttingengineers.com) [info@nuttingengineers.com](mailto:info@nuttingengineers.com)





# Nutting Engineers

of Florida Inc. | Established 1967  
*Your Project is Our Commitment*

2051 N.W. 112th Avenue, Suite 126  
Miami, Florida 33172  
305-557-3083  
Toll Free: 877-NUTTING (688-8464)  
Fax: 305-824-8827  
Broward 954-941-8700  
Palm Beach 561-736-4900  
St. Lucie 772-408-1050  
[www.nuttingengineers.com](http://www.nuttingengineers.com)

Geotechnical and Construction Materials | Engineering, Testing and Inspections | Environmental Services

February 23, 2012

Mr. Andrew Smyth  
CH2M Hill  
6410 5<sup>th</sup> Street, Suite 2A  
Key West, Florida 33040  
Phone: (305) 294-1645  
Fax: (305) 294-4913  
Email: [asmith@ch2m.com](mailto:asmith@ch2m.com)

Subject: Report of Geotechnical Exploration  
**Zero Duval Seawall**  
Terminus of Duval St.  
Key West, Florida

Dear Mr. Smyth:

Nutting Engineers of Florida, Inc. (NE), has performed a Geotechnical Exploration for the seawall replacement at the above referenced site in Key West, Florida. The purpose of this exploration was to obtain information regarding subsurface conditions at specific test locations in order to provide engineering parameters for the soils as part of the retaining wall design process. This report presents our findings and a brief geotechnical report based upon the information obtained.

## PROJECT INFORMATION

We understand that project plans call for the construction of a new sheet pile wall outside of the existing wall. Currently there is an existing bulkhead and large stormwater outfall penetration at the site. The water depth at the site ranges from approximately 9 to 12 feet with a maximum tidal variation of about 4 feet. The existing bulkhead is approximately 54 feet long. As this project is still in the early design stages, details concerning the type walls and construction methods have not been determined. NE should be notified in writing by the client of any changes in the proposed construction along with a request to amend our foundation analysis and/or recommendations within this report as appropriate.

## GENERAL SUBSURFACE CONDITIONS

### Subsurface Exploration

NUTTING ENGINEERS OF FLORIDA, INC. was requested to perform two Standard Penetration Test (SPT) borings (ASTM D-1586) to an elevation of -45 feet NGVD. The locations of the test borings are indicated on the Test Boring Location Plan presented in the Appendix of this report. The boring locations were identified in the field using approximate methods and available surface controls. As such the soil boring locations should be considered to be approximate.

### Test Boring Results

In general, the test boring on the water side of the existing bulkhead (B-1) revealed a water depth of approximately twelve feet, followed by one foot of loose limestone fragments and trace sand. From approximately thirteen feet to twenty three feet below water surface, the test boring noted very soft silt, followed by soft to medium hard limestone to fifty seven feet (-56 ft., NGVD), the maximum depth explored. We note that the boring was extended due to the very soft silt encountered.

The land side boring (B-2) generally revealed loose to medium dense sand and limestone fragments in varying portions to approximately twelve feet, followed by very soft silt to approximately seventeen feet below grade. Below the silt layer, very soft peat was noted to a depth of approximately twenty two feet, underlain by medium dense sand to approximately thirty three feet below grade. Below this layer, medium hard to hard limestone was observed to a depth of forty five feet (-42 ft., NGVD), the maximum depth explored.

One of the most important characteristics of the limestone formation encountered in this area is the degree of solution. The limestone is often times solufied and filled with unconsolidated sand or silt forming pockets during the geologic past. A detailed description of the soil/rock interlayering is given on the test boring logs in the Appendix.

### Generalized Soil Parameters

In order to analyze the loading conditions of seawall elements, the study of soil parameters for each stratum was conducted and obtained from the empirical correlations and our experiences based on the review of the field and lab test data. The parameters obtained include N value, internal friction angle ( $\phi$ ), and unit weight.

The following table, Table 1, presents the soil parameters for each stratum as well as generalized subsurface soil profiles as encountered at the proposed structure location. Details regarding the relatively complex interlayering of the subsoils are shown on the Soil Profile Sheet in the Appendix.

**General Subsurface Profiles and Soil Parameters  
(B-1 & B-2)**

Approx. Depth* (Feet)	Soil Description	N-Values (Blows/ft)	Internal Friction Angle $\phi$ (degrees)	Submerged Unit Weight (pcf)	Consistency and Relative Density
12-13	SAND and LIMESTONE FRAGMENTS	9	30	47	Loose
13-23	SILT and/or PEAT	0-2	28	27	Soft
23-57	LIMESTONE, some fine to coarse sand	11-100+	-	62-67	Soft to Very Hard

\*measured from approximate water surface

**ANALYSIS AND RECOMMENDATIONS**

The sheet piles should be installed in accordance with the local codes and good general practice by a competent sheet piling contractor familiar with local conditions. Rock fragments and/or pinnacles of limestone along with very soft silt and peat should be anticipated as part of the seawall. Difficult driving conditions should be anticipated once the soft to very hard limestone is encountered at depths of approximately 23 to 30 feet below the water surface. Discussions should be held between us, the owner, and the piling contractor regarding installation procedures.

In the event sheet piles are installed via vibration, it should be noted that vibratory installation of sheet piles and other construction equipment may cause vibrations that could be felt by persons within nearby buildings and could potentially induce cosmetic damage or structural settlements. Additionally, preexisting settlements may exist within these structures that could be construed to have been caused or worsened by the vibratory equipment after the fact. Pre- and post condition surveys of these structures along with vibration monitoring during installation could be performed to better evaluate this concern. The contractor should exercise due care during the installation with due consideration of potential impacts on existing structures.

Once the design and construction plans are more firmly established, we can provide more detailed input concerning geotechnical considerations for the project. We are available to discuss our findings and recommend discussions be held with us, the specialty contractor, designer and other interested parties as the project progresses.

## GENERAL INFORMATION

Our client for this geotechnical evaluation was:

CH2M Hill  
6410 5<sup>th</sup> Street, Suite 2A  
Key West, Florida 33040

The contents of this report are for the exclusive use of the client and the City of Key West for the purpose of the design package. Information conveyed in this report shall not be used or relied upon by other parties or for other projects without the expressed written consent of Nutting Engineers of Florida, Inc. This report discusses geotechnical considerations for this site based upon observed conditions and our understanding of proposed construction. Environmental issues including (but not limited to), soil and/or groundwater contamination are beyond our scope of service for this project. As such, this report should not be used or relied upon for evaluation of environmental issues.

If conditions are encountered which are not consistent with the findings presented in this report, or if proposed construction is moved from the location investigated, this office shall be notified immediately so that the condition or change can be evaluated and appropriate action taken.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with general accepted professional practice in the field of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

We appreciate the opportunity to provide these services for you. If we can be of any further assistance, or if you need additional information, please feel free to contact us.

Sincerely,  
**NUTTING ENGINEERS OF FLORIDA, INC.**



2/23/12

Paul C. Catledge, P.E. #68448  
Senior Engineer



Richard C. Wohlfarth, P.E.  
Director of Engineering

Appendix:    Boring Location Plan  
                  Soil Profiles  
                  Test Boring Logs  
                  Limitations of Liability  
                  Soil Classification Criteria

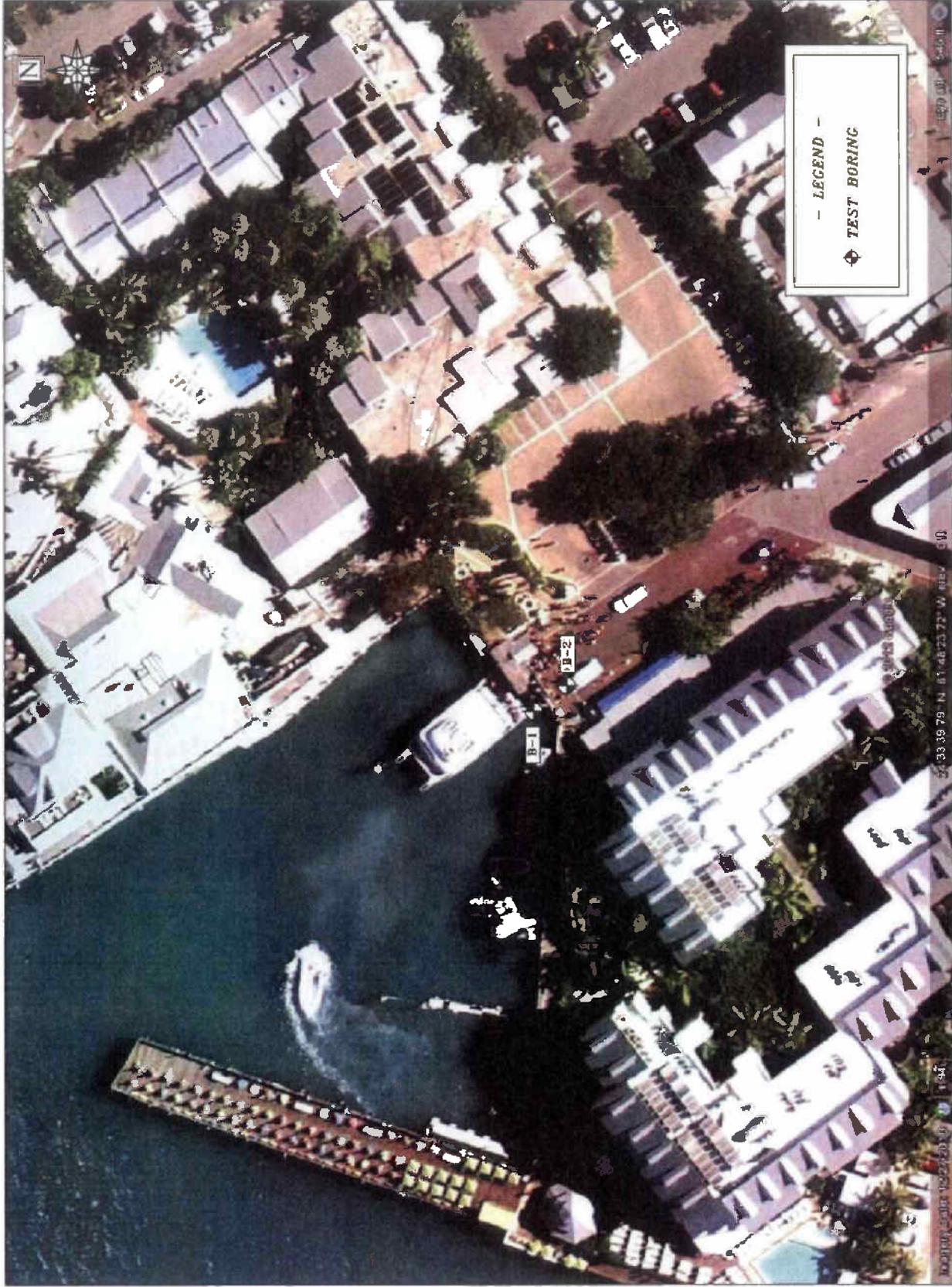


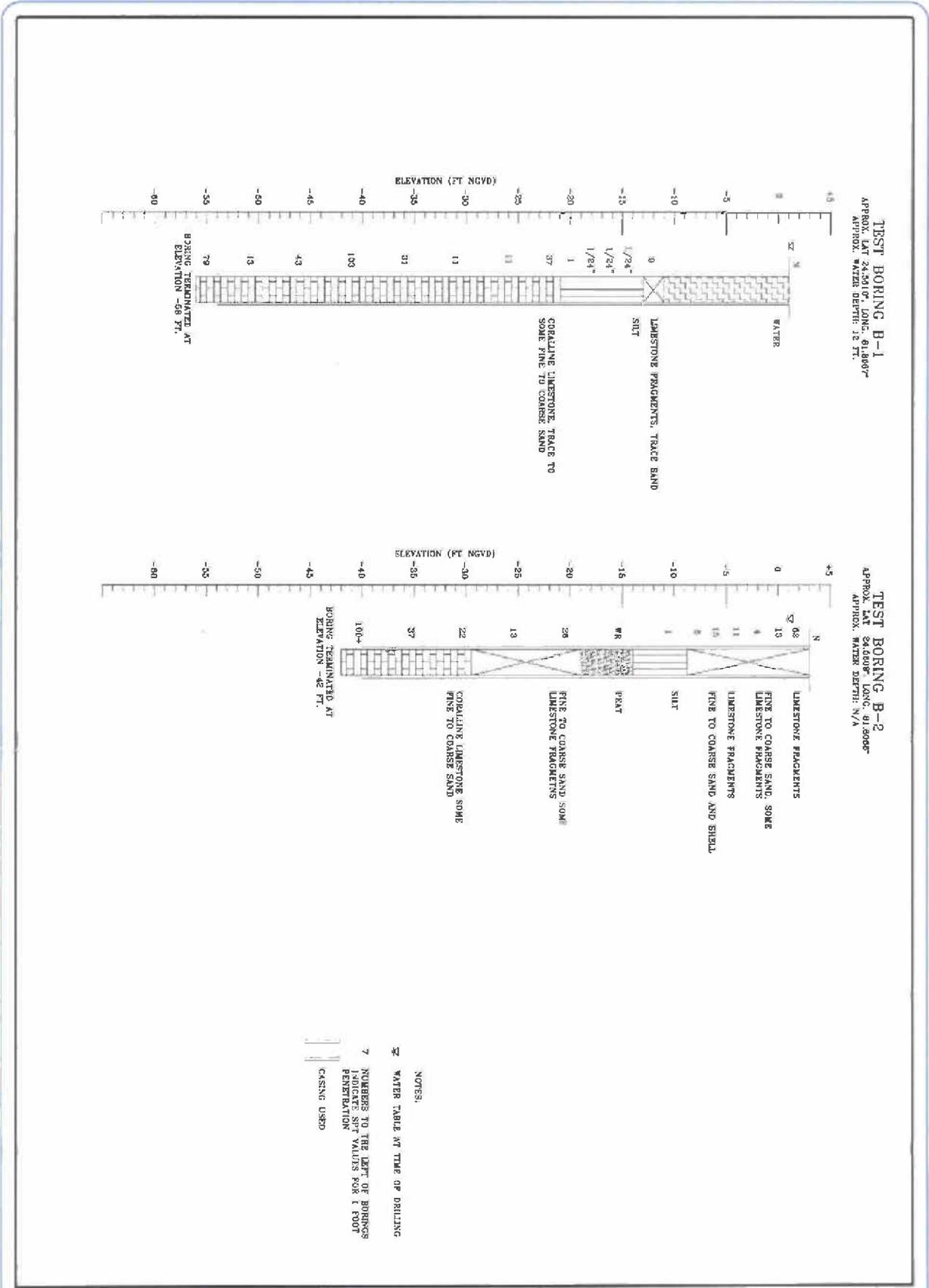
FIGURE 1

NOT TO SCALE

APPROXIMATE  
TEST LOCATIONS

ZERO DUVAL SEAWALL  
TERMINUS OF DUVAL STREET  
KEY WEST, FLORIDA

**NUTTING**  
**ENGINEERS**  
OF FLORIDA, INC.  
ESTABLISHED 1907



**FIGURE 2**

**SOIL PROFILES**

**ZERO DUVAL SITE**  
**KEY WEST, FLORIDA**

**NOT TO SCALE**  
**PROJECT NO. 126212**

**LEGEND**

- WATER
- SAND (SP)
- SILT (SP)
- PEAT (SP)
- LIMESTONE



1310 Neptune Drive  
 Boynton Beach, FL 33426  
 Telephone: 561-736-4900  
 Fax: 561-737-9975

**BORING NUMBER B-1**

PAGE 1 OF 2

CLIENT CH2M Hill PROJECT NUMBER 126.21.2

PROJECT LOCATION Key West, FL PROJECT NAME Site 2 - Zero Duval Seawall

DATE STARTED 1/21/12 COMPLETED 1/21/12 SURFACE ELEVATION REFERENCE \_\_\_\_\_

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS: \_\_\_\_\_

LOGGED BY T. Simmons CHECKED BY C. Gworek AT TIME OF DRILLING ---

APPROXIMATE LOCATION OF BORING As located on site plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲			
						10	20	30	40
						PL      MC      LL 20    40    60    80			
						□ FINES CONTENT (%) □			
						20    40    60    80			
0		WATER							
5									
10									
14.5		Gray LIMESTONE FRAGMENTS, trace quartz fine SAND	SS 1	5-5-4-1	9				
15		Gray SILT	SS 2	1/24"					
16.5			SS 3	1/24"					
18			SS 4	1/24"					
20.5			SS 5	1/12"-1-1					
23.5		Lt. tan porous coralline LIMESTONE, little quartz fine sand, trace brown peat	SS 6	1-20-17-10	37				
24.5		Lt. tan porous coralline LIMESTONE and silty quartz fine SAND							
27.5			SS 7	5-7-4	11				
30.5		Lt. tan porous coralline LIMESTONE, little quartz fine sand	SS 8	4-4-7	11				
35.5			SS 9	10-17-14	31				
40		-Mud loss -38 to -56 NGVD							

(Continued Next Page)



1310 Neptune Drive  
 Boynton Beach, FL 33426  
 Telephone: 561-736-4900  
 Fax: 561-737-9975

**BORING NUMBER B-1**

PROJECT NUMBER 126.21.2

CLIENT CH2M Hill

PROJECT NAME Site 2 - Zero Duval Seawall

PROJECT LOCATION Key West, FL

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲				
						10	20	30	40	
						PL      MC      LL 20    40    60    80				
						<input type="checkbox"/> PINES CONTENT (%) <input type="checkbox"/> 20    40    60    80				
40		Lt. tan porous coralline LIMESTONE, trace quartz fine sand	SS 10	53-57-46	103					>> ▲
45			SS 11	21-20-23	43					▲
50			SS 12	6-6-7	13					▲
55			-Mud loss -38 to -56 NGVD	SS 13	31-36-43	79				
		Boring terminated at -56' NGVD								

TEST NUTTING BOREHOLE 2-126.21.2 CH2M HILL - SITE 2 ZERO DUVAL SEAWALL.GPJ GINT US.GDT 2/23/12



1310 Neptune Drive  
 Boynton Beach, FL 33426  
 Telephone: 561-736-4900  
 Fax: 561-737-9975

# BORING NUMBER B-2

PAGE 1 OF 2

PROJECT NUMBER 126.21.2

CLIENT CH2M Hill

PROJECT NAME Site 2 - Zero Duval Seawall

PROJECT LOCATION Key West, FL

DATE STARTED 1/25/12

COMPLETED 1/25/12

SURFACE ELEVATION REFERENCE +3' NGVD

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY T. Simmons

CHECKED BY C. Gworek

AT TIME OF DRILLING 2.0 ft

APPROXIMATE LOCATION OF BORING As located on site plan

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲				
						10	20	30	40	
						PL      MC      LL 20    40    60    80				
						<input type="checkbox"/> FINES CONTENT (%) <input type="checkbox"/> 20    40    60    80				
0		Lt. tan coralline LIMESTONE FRAGMENTS	1	23-34-28-31	62					>>▲
		Lt. gray quartz fine SAND, some limestone fragments	2	24-8-5-2	13		▲			
5		Lt. gray silty quartz fine SAND, little limestone fragments	3	2-1-3-3	4	▲				
		Lt. gray coralline LIMESTONE FRAGMENTS	4	4-3-8-51	11		▲			
10		Gray quartz fine SAND and shell	5	23-8-7-8	15			▲		
		Lt. tan quartz fine SAND and shell, little limestone fragments	6	7-5-1-1	6	▲				
		Gray SILT								
15			7	1-1-0	1	▲				
		Brown PEAT								
20			8	WR						
		Lt. tan silty quartz fine SAND, some limestone fragments								
25			9	7-15-11	26			▲		
30			10	4-5-8	13		▲			
		Lt. tan porous coralline LIMESTONE, some quartz fine sand								
35			11	7-9-13	22			▲		
40			12	6-8-29	37					▲

(Continued Next Page)

Disclaimer: Nutting Engineers of Florida, Inc. accepts no liability for the consequences of the independent interpretation of drilling logs by others.



1310 Neptune Drive  
 Boynton Beach, FL 33426  
 Telephone: 561-736-4900  
 Fax: 561-737-9975

**BORING NUMBER B-2**

PROJECT NUMBER 126.21.2

CLIENT CH2M Hill

PROJECT NAME Site 2 - Zero Duval Seawall

PROJECT LOCATION Kev West, FL

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	Blows	N-Value	▲ SPT N VALUE ▲			
						10	20	30	40
						PL      MC      LL 20    40    60    80			
						<input type="checkbox"/> FINES CONTENT (%) <input type="checkbox"/> 20    40    60    80			
40		Lt. tan porous coralline LIMESTONE, some quartz fine sand <i>(continued)</i>							
45			13	50/1"	100+				>>
		Boring terminated at -42' NGVD							

TEST NUTTING BOREHOLE 2 126.21.2 CH2M HILL - SITE 2 ZERO DUVAL SEAWALL GPJ GINT US\_GDT 2/23/12

## LIMITATIONS OF LIABILITY

### WARRANTY

We warrant that the services performed by Nutting Engineers of Florida, Inc. are conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession in our area currently practicing under similar conditions at the time our services were performed. **No other warranties, expressed or implied, are made.** While the services of Nutting Engineers of Florida, Inc. are a valuable and integral part of the design and construction teams, we do not warrant, guarantee or insure the quality, completeness, or satisfactory performance of designs, construction plans, specifications we have not prepared, nor the ultimate performance of building site materials or assembly/construction.

### SUBSURFACE EXPLORATION

Subsurface exploration is normally accomplished by test borings; test pits are sometimes employed. The method of determining the boring location and the surface elevation at the boring is noted in the report. This information is represented in the soil boring logs and/or a drawing. The location and elevation of the borings should be considered accurate only to the degree inherent with the method used and may be approximate.

The soil boring log includes sampling information, description of the materials recovered, approximate depths of boundaries between soil and rock strata as encountered and immediate depth to water data. The log represents conditions recorded specifically at the location where and when the boring was made. Site conditions may vary through time as will subsurface conditions. The boundaries between different soil strata as encountered are indicated at specific depths; however, these depths are in fact approximate and dependent upon the frequency of sampling, nature and consistency of the respective strata. Substantial variation between soil borings may commonly exist in subsurface conditions. Water level readings are made at the time and under conditions stated on the boring logs. Water levels change with time, precipitation, canal level, local well drawdown and other factors. Water level data provided on soil boring logs shall not be relied upon for groundwater based design or construction considerations.

### LABORATORY AND FIELD TESTS

Tests are performed in *general* accordance with specific ASTM Standards unless otherwise indicated. All criteria included in a given ASTM Standard are not always required and performed. Each test boring report indicates the measurements and data developed at each specific test location.

### ANALYSIS AND RECOMMENDATIONS

The geotechnical report is prepared primarily to aid in the design of site work and structural foundations. Although the information in the report is expected to be sufficient for these purposes, it shall not be utilized to determine the cost of construction nor to stand alone as a construction specification. Contractors shall verify subsurface conditions as may be appropriate prior to undertaking subsurface work.

Report recommendations are based primarily on data from test borings made at the locations shown on the test boring reports. Soil variations commonly exist between boring locations. Such variations may not become evident until construction. Test pits sometimes provide valuable supplemental information that derived from soil borings. If variations are then noted, the geotechnical engineer shall be contacted in writing immediately so that field conditions can be examined and recommendations revised if necessary.

The geotechnical report states our understanding as to the location, dimensions and structural features proposed for the site. **Any significant changes of the site improvements or site conditions must be communicated in writing to the geotechnical engineer immediately** so that the geotechnical analysis, conclusions, and recommendations can be reviewed and appropriately adjusted as necessary.

### CONSTRUCTION OBSERVATION

Construction observation and testing is an important element of geotechnical services. The geotechnical engineer's field representative (G.E.F.R.) is the "owner's representative" observing the work of the contractor, performing tests and reporting data from such tests and observations. **The geotechnical engineer's field representative does not direct the contractor's construction means, methods, operations or personnel.** The G.E.F.R. does not interfere with the relationship between the owner and the contractor and, except as an observer, does not become a substitute owner on site. The G.E.F.R. is responsible for his/her safety, but has no responsibility for the safety of other personnel at the site. The G.E.F.R. is an important member of a team whose responsibility is to observe and test the work being done and report to the owner whether that work is being carried out in general conformance with the plans and specifications. The enclosed report may be relied upon solely by the named client.

# SOIL AND ROCK CLASSIFICATION CRITERIA

## SAND/SILT

N-VALUE (bpf)	RELATIVE DENSITY
0 - 4	Very Loose
5 - 10	Loose
11 - 29	Medium
30 - 49	Dense
>50	Very dense
100	Refusal

## CLAY/SILTY CLAY

N-VALUE (bpf)	UNCONFINED COMP. STRENGTH (tsf)	CONSISTENCY
<2	<0.25	v. Soft
2 - 4	0.25 - 0.50	Soft
5 - 8	0.50 - 1.00	Medium
9 - 15	1.00 - 2.00	Soft
16 - 30	2.00 - 4.00	v. Stiff
>30	>4.00	Hard

## ROCK

N-VALUE (bpf)	RELATIVE HARDNESS	ROCK CHARACTERISTICS
N ≥ 100	Hard to v. hard	Local rock formations vary in hardness from soft to very hard within short vertical and horizontal distances and often contain vertical solution holes of 3 to 36 inch diameter to varying depths and horizontal solution features. Rock may be brittle to split spoon impact, but more resistant to excavation.
25 ≤ N ≤ 100	Medium hard to hard	
5 ≤ N ≤ 25	Soft to medium hard	

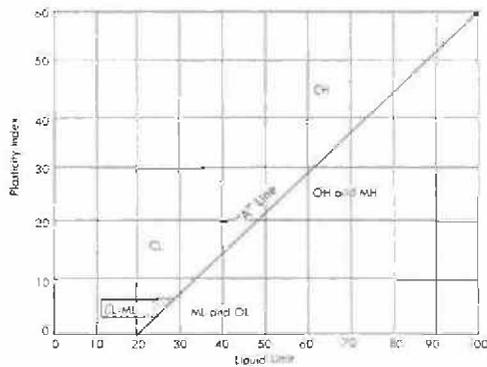
## PARTICLE SIZE

Boulder	>12 in.
Cobble	3 to 12 in.
Gravel	4.76 mm to 3 in.
Sand	0.074 mm to 4.76 mm
Silt	0.005 mm to 0.074 mm
Clay	<0.005 mm

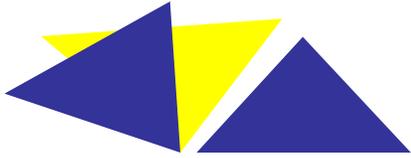
## DESCRIPTION MODIFIERS

0 - 5%	Slight trace
6 - 10%	Trace
11 - 20%	Little
21 - 35%	Some
>35%	And

Major Divisions	Group Symbols	Typical names	Laboratory classification criteria		
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	<p>Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:</p> <p>Less than five percent.....GW, GP, SW, SP                      More than 12 percent.....GM, GC, SM, SC                      5 to 12 percent..... Borderline cases requiring dual systems**</p>	
		Foamy graded gravels, gravel-sand mixtures, little or no fines	GP		
		Silty gravels, gravel-sand-silt mixtures	GW*		
	Gravels with fines (Appreciable amount of fines)	Clayey gravels, gravel-sand-clay mixtures	GC		
		Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)		SW
			Foamly graded sands, gravelly sands, little or no fines		SP
	Sands with fines (Appreciable amount of fines)	Silty sands, sand-silt mixtures	SM*		
		Clayey sands, sand-clay mixtures	SC		
		$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for GW			
		Atterberg limits below "A" line or P.I. less than 4 Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols. Atterberg limits above "A" line with P.I. greater than 7			
Fine-grained soils (More than half of material is smaller than No. 200 sieve size)	Sands and silts (liquid limit less than 50)	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	ML		
		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	CL		
		Organic silts and organic silty clays of low plasticity	OL		
	Sands and clays (liquid limit greater than 50)	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	MH		
		Inorganic clays of high plasticity, fat clays	CH		
		Organic clays of medium to high plasticity, organic silts	OH		
	Highly organic soils	PT	Peat and other highly organic soils		
	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for SW				
	Atterberg limits below "A" line or P.I. less than 4 Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual system. Atterberg limits above "A" line with P.I. more than 7				



Plasticity Chart



**G. M. SELBY, Inc.**

---

## **DUVAL STREET SEAWALL INSPECTION REPORT**



**October 2008**

## Introduction

G. M. Selby was contracted by the City of Key West to inspect the seawall located at the North end of Duval Street.

Selby inspected the site on three different occasions due to low visibility of the water column. No existing plans were found for the seawall, therefore Selby measured out the entire site to locate all necessary utilities and structures for the inspection and subsequent design of a replacement sea wall.

It was reported to Selby engineers that the seawall was not retaining the fill behind the wall. This was confirmed to us by the glass bottom boat Captain that works at the site on a daily basis.

## Sea Wall Condition

The seawall is for the most part not failing catastrophically, it is not falling into the water; however at each end (east and west) the engineer found holes and could feel the warm water from the upland seeping through. This was confirmed when the engineer compared the leakage flow to the flow of the outfall; the outfall flow was measured at one knot flow rate.

In addition, there are remnants of an older seawall which is heavily corroded with sharp protruding edges posing a danger to anyone entering the water under the deck. This oxidizing metal also contributes to an anodic reaction of metal objects such as vessels and other metallic components (bolts fasteners etc).

The outfall pipe located mid span of the seawall, was loose at the wall junction and a portion of its baffle or seal was loose and swaying in the water. Besides the sheet pile showing signs of corrosion, so did the pile cap, which exhibited cracking and discoloration from steel corroding from within.

It is very apparent that during storm events the fill behind the wall escapes via the holes at each end of the wall, thus contributing to the sinking of the road behind the wall at a few locations. At high tide (Spring tide) the water pressure actually causes a backflow and comes out of the inlet on Duval Street causing localized flooding. The engineer also noticed overtopping of the wall during extreme spring tide whereby the flow actually spills over the wall into the street.

On the east side, a pocket is formed where the wall makes a 90 degree turn. This area is prone to a resonance effect when swells are incoming due to boat wakes. This small area encounters the brunt of direct forces and has signs of long term erosion/abrasion. It is also an area where there are signs of water leaking out from the uplands contributing to the loss of fill behind the seawall.

The seawall does not seem to be in any danger of collapse. It has aged and is not functioning correctly as a retaining wall any longer, as such contributing to the sinking effect behind the wall, on the street.

## Evaluation of Alternative Solutions

Selby engineers researched the various options to provide a solution to stop the leakage and deterioration of the existing seawall. We analyzed the following solutions:

1. Form a concrete seawall in front of existing wall and pour it in plane using high strength hydraulic marine concrete admixture.
2. Remove existing seawall and replace with a steel sheet piling wall.
3. Patch the wall
4. Install an aluminum sheet pile wall in front of the existing seawall with a hydraulic cement buffer.
5. The drawings depict two solution for the drainage/pollution control chamber before allowing runoff into the adjacent water.

## Recommendations

Selby engineers recommend removing the improvements above the wall, demolishing the cap and installing a new aluminum sheet pile wall in front of the existing wall. In addition, the contractor needs to

remove the old steel sheet piling remnants and install a baffle on the east side pocket area in order to dampen the wave energy.

Please see the attached drawings which show the entire new design of the wall, outfall and associated structures.

The other alternative solutions do not warrant consideration either due to logistics (concrete form) or due to unsatisfactory result vs. expenditure (patch). Removing the existing seawall could potentially cause failure of the adjacent upland as well as undermine adjacent structures and as such is ruled out as an option.

Gerald Zadikoff, PE  
FL 44206

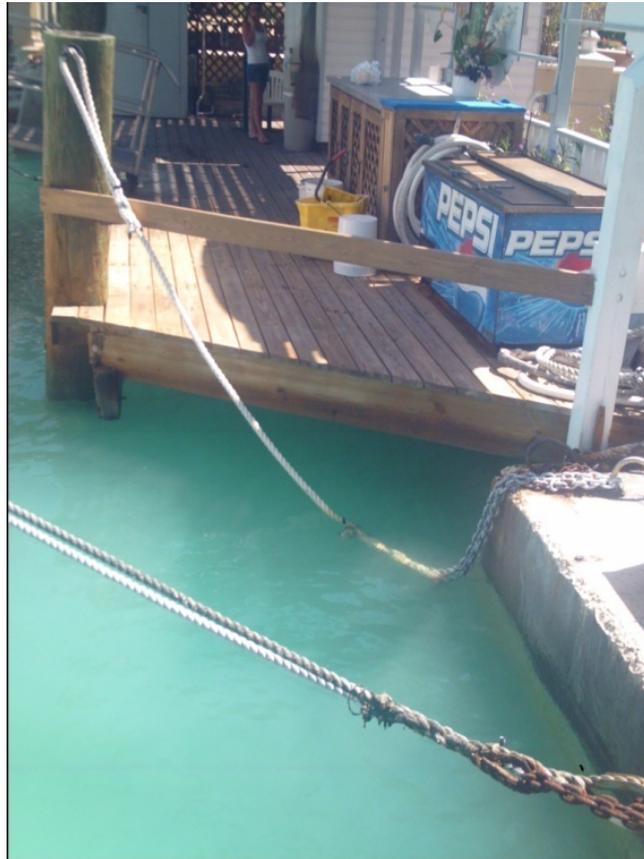
## PHOTOGRAPHIC DOCUMENTATION



Inlet behind the wall not draining, notice the sinking of the brick.  
(Low to mid – tide)



View from the east side



View from the west side



Cracks in the Sea Wall Cap



Corroded Steel to be Removed



Old Corroded Steel East End



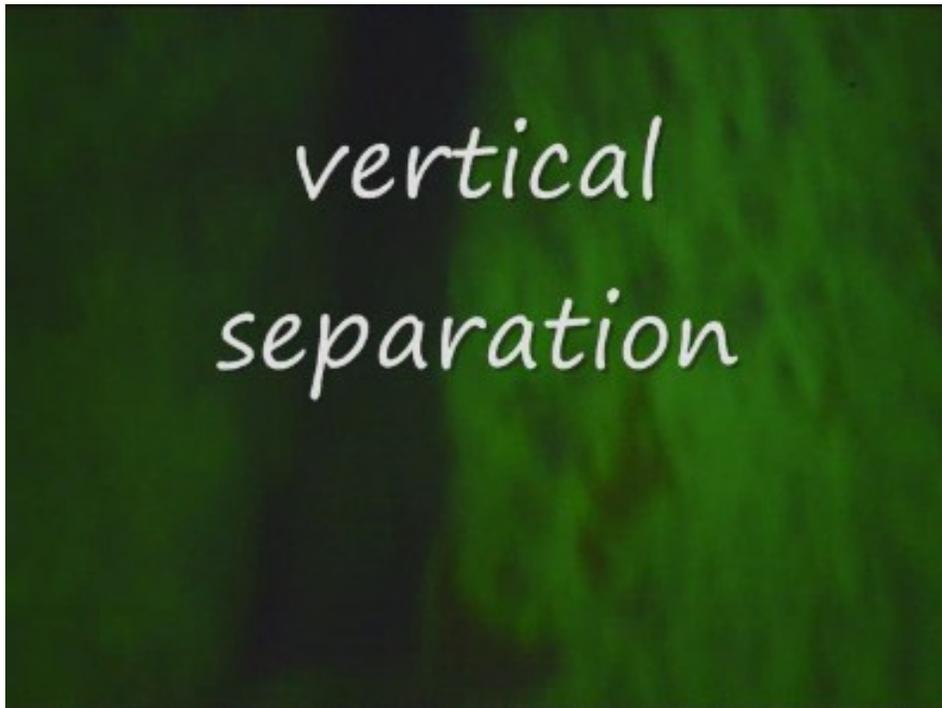
Area of High Wave Energy East End



Vertical Crack (separation)



Sheet Piling Under Deck



Vertical Separation



Cracks in Concrete Section West End



West End Hole



View of Sea Wall and Cap



**FLORIDA DEPARTMENT OF  
ENVIRONMENTAL PROTECTION**

South District Branch Office  
2796 Overseas Highway, Suite 221  
Marathon, FL 33050

RICK SCOTT  
GOVERNOR

HERSCHEL T. VINYARD JR.  
SECRETARY

**VIA ELECTRONIC MAIL**

**Permittee/Authorized Entity:**

City of Key West  
3132 Flagler Avenue  
Key West, FL 33040

**Seawall Repair**

**Authorized Agent:**

CH2M Hill  
c/o Benjamin Brice  
1101 Channelside Drive, Suite 200 South  
Tampa, FL 33602  
[BBrice@ch2m.com](mailto:BBrice@ch2m.com)

**Environmental Resource Permit  
State-owned Submerged Lands Authorization - Granted**

**U.S. Army Corps of Engineers Authorization - Separate Corps  
Authorization Required**

Permit No.: 44-0300867-002  
Lease No. 44026265

**Permit Issuance Date: September 24, 2013  
Permit Construction Phase Expiration Date: September 24, 2018**

# Consolidated Environmental Resource Permit and State-owned Submerged Lands Authorization

**Permittee: City of Key West**

**Permit No: 44-0300867-002**

**Lease No: 44026265**

## **PROJECT LOCATION**

The activities authorized by this Permit and state-owned submerged lands authorization are located at 2 Duval Street, Key West, in Section 31, Township 67 South, Range 25 East, Monroe County; Parcel Id. No. 00072082-000400.

## **AUTHORIZATIONS**

### **Seawall repair**

#### Project Description

The permittee is authorized to repair an existing seawall within Man of War Harbor, a Class III Waterbody. Authorized activities are depicted on the attached drawings.

The project described above may be conducted only in accordance with the terms, conditions and attachments contained in this permit. The issuance of this permit does not infer, nor guarantee, nor imply that future permits or modifications will be granted by the Department.

Please be advised that this permit does not constitute the issuance of a NPDES Stormwater Permit or acceptance of an NPDES Stormwater Pollution Prevention Plan. For additional information regarding this matter please contact the NPDES Stormwater Notices Center toll free at (866) 336-6312 or Department personnel in Tallahassee at (850) 245-7522.

#### Sovereignty Submerged Lands Authorization

The activity is located on submerged lands owned by the State of Florida. It therefore also requires authorization, from the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 Florida Statutes (F.S.) and Chapter 258, F.S.

As staff to the Board of Trustees, the Department has determined that the activity qualifies for a Letter of Consent, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. During the term of this Letter of Consent you shall maintain satisfactory evidence of sufficient upland interest as required by paragraph 18-21.004(3)(b), Florida Administrative Code. If such interest is terminated or the Board of Trustees determines that such interest did not exist on the date of issuance of this Letter of Consent, this

Permittee: City of Key West

Permit No: 44-0300867-002

Page 2 of 14

Permit Expiration: September 24, 2018

Letter of Consent may be terminated by the Board of Trustees at its sole option. If the Board of Trustees terminates this Letter of Consent, you agree not to assert a claim or defense against the Board of Trustees arising out of this Letter of Consent.

By your acceptance of this Letter of Consent, you agree to be bound by the terms and conditions contained herein.

#### Federal Authorization

A copy of this permit has been sent to the U.S. Army Corps of Engineers (USACE). The USACE may require a separate permit. Failure to obtain any required federal permits prior to construction could subject you to enforcement action by that agency.

#### Coastal Zone Management

This permit also constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Management Act.

#### Water Quality Certification

This permit constitutes certification of compliance with state water quality standards under Section 401 of the Clean Water Act, 33 U.S.C. 1341.

#### Other Authorizations

You are advised that authorizations or permits for this project may be required by other federal, state or local entities including but not limited to local governments and homeowner's associations. This permit does not relieve you from the requirements to obtain all other required permits or authorizations.

In addition, you are advised that your project may require additional authorizations or permits from the municipality/county in which the project is located. Please be sure to contact the local county building and environmental department to obtain these required authorizations.

### **PERMIT/SOVEREIGNTY SUBMERGED LANDS CONDITIONS**

The activities described herein must be conducted in accordance with:

- **The Specific Conditions**
- **The General Conditions**
- **The General Consent Conditions for Sovereignty Submerged Lands Authorization**
- **The limits, conditions and locations of work shown in the attached drawings**
- **The term limits of this authorization**

You are advised to read and understand these conditions and drawings prior to commencing the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings. If you are utilizing a contractor, the contractor also should read and understand these conditions and

drawings prior to commencing the authorized activities. Failure to comply with these conditions, including any mitigation requirements, shall constitute grounds for revocation of the Permit and appropriate enforcement action by the Department.

Operation of the facility is not authorized except when determined to be in conformance with all applicable rules and this permit/certification/authorization and sovereignty submerged lands authorization, as specifically described above.

## SPECIFIC CONDITIONS

1. All submittals of information required by this permit shall be submitted to the Department's Marathon office at 2796 Overseas Highway, Suite 221, Marathon, Florida 33050.
2. Best management practices for erosion control shall be implemented and maintained at all times to prevent siltation and turbid discharges in excess of State Water Quality Standards, pursuant to Rule 62-302, F.A.C. All practices shall be in accordance with the guidelines and specifications described in the Florida Erosion and Sedimentation Control Inspector's Manual, FDEP (2008), available on the Department's website at <http://www.dep.state.fl.us/water/nonpoint/docs/erosion/erosion-inspectors-manual.pdf>. Methods shall include, but are not limited to the immediate placement of turbidity containment devices such as turbidity screens, silt containment fences, and earthen berms, etc., to contain any potential erosion or turbidity. Earthen berms shall not impact wetlands or other surface waters as defined by Rule 62-340, F.A.C. Following the completion of construction, the Permittee shall be responsible for the removal of the turbidity barriers and shall correct any erosion or shoaling that has the potential to cause adverse impacts to wetlands or surface waters.
3. The project shall comply with applicable State Water Quality Standards of Chapter 62-302, F.A.C., namely:
  - 62-302.500 – Minimum Criteria for All Waters at All Times and All Places
  - 62-302.530 – Surface Water Quality Criteria
4. **No later than 60 days after construction commencement**, permanent manatee educational signs must be installed by the permittee. In the event the signs fade, become damaged or outdated, they must be replaced and maintained for the life of the facility. The on-site locations and types of signs must be acceptable to the Florida Fish and Wildlife Conservation Commission, which can be contacted at [ImperiledSpecies@myfwc.com](mailto:ImperiledSpecies@myfwc.com). The types of signs, sign vendors, and the process for FWC approval can be found at: <http://www.myfwc.com/wildlifehabitats/managed/manatee/signs/>.

5. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with, and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

6. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

7. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee movement.

8. All on-site project personnel are responsible for observing water-related activities for the presence of manatees. All in-water operations, including vessels, shall be shutdown if a manatee comes within 50 feet of the operation. Activities shall not resume until every manatee has moved beyond the 50-foot radius of the project operation, or until 30 minutes has elapsed wherein a manatee has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving.

9. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida.

10. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used. One sign measuring at least 3 ft. by 4 ft. which reads *Caution: Manatee Area* must be posted. A second sign measuring at least 8 1/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. Please see the Florida Fish and Wildlife Conservation Commission website for information on how to obtain appropriate signs:

[http://www.myfwc.com/docs/WildlifeHabitats/Manatee\\_EducationalSign.pdf](http://www.myfwc.com/docs/WildlifeHabitats/Manatee_EducationalSign.pdf)

11. In the event discrepancies exist between the permit drawings and the Specific Conditions of this permit, the Specific Conditions shall prevail.

*Note: In the event of an emergency, the Permittee should contact the Department by calling (800)320-0519. During normal business hours, the permittee should call (239)344-5600.*

## **GENERAL CONDITIONS:**

1. All activities authorized by this permit shall be implemented as set forth in the plans, specifications and performance criteria as approved by this permit. Any deviation from the permitted activity and the conditions for undertaking that activity shall constitute a violation of this permit and a violation of Part IV of Chapter 373, (F.S.).
2. This permit or a copy thereof, complete with all conditions, attachments, exhibits, and modifications shall be kept at the work site of the permitted activity. The complete permit shall be available for review at the work site upon request by the Department staff. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.
3. Activities approved by this permit shall be conducted in a manner which does not cause violations of state water quality standards. The permittee shall implement best management practices for erosion and pollution control to prevent violations of state water quality standards. Temporary erosion control shall be implemented prior to and during construction and permanent control measures shall be completed within seven (7) days of any construction activity. Turbidity barriers shall be installed and maintained at all locations where the possibility of transferring suspended solids into the receiving water-body exists due to the permitted work. Turbidity barriers shall remain in place at all locations until construction is completed and soils are stabilized and vegetation has been established. All practices shall be in accordance with the guidelines and specifications described in Chapter Six of the Florida Land Development Manual; A Guide to Sound Land and Water Management (Department of Environmental Regulation, 1988), unless a project-specific erosion and sediment control plan is approved as part of the permit. Thereafter, the permittee shall be responsible for the removal of the barriers. The permittee shall correct any erosion or shoaling that causes adverse impacts to the water resources.
4. The permittee shall notify the Department of the anticipated construction start date within thirty (30) days of the date that this permit is issued. **At least forty-eight (48) hours prior** to commencement of the activity authorized by this permit, the permittee shall submit to the Department an "Environmental Resource Permit Construction Commencement" notice (Form No. 62-343.900(3), Florida Administrative Code (F.A.C.)) indicating the actual start date and expected completion date.
5. When the duration of construction will exceed one year, the permittee shall submit construction status reports to the Department on an annual basis utilizing an

“Annual Status Report Form” (Form No. 62-343.900(4), F.A.C.). Status Report Forms shall be submitted the following June of each year.

6. **Within thirty (30) days after completion of construction** of the permitted activity, the permittee shall submit a written statement of completion and certification by a registered professional engineer or other appropriate individual as authorized by law utilizing the supplied “Environmental Resource Permit As-Built Certification by a Registered Professional” (Form No. 62-343.900(5), F.A.C.). The Statement of completion and certification shall be based on on-site observation of construction or review of as-built drawings for the purpose of determining if the work was completed in compliance with permitted plans and specifications. This submittal shall serve to notify the Department that the system is ready for inspection. Additionally, if deviations from the approved drawings are discovered during the certification process, the certification must be accompanied by a copy of the approved permit drawings with deviations note. Both the original and revised specifications must be clearly shown. The plans must be clearly labeled as “as-built” or “record” drawing. All surveyed dimensions and elevations shall be certified by a registered surveyor.

7. The operation phase of this permit shall not become effective; until the permittee has complied with the requirements of condition number six (6) above, has **submitted a “Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase” (Form 62-343.900(7), F.A.C.)**; the Department determines the system to be in compliance with the permitted plans and specifications; and the entity approved by the Department in accordance with Sections 9.0 and 10.0 of the Basis of Review for Environmental Resource Permit Applications Within the South Florida Water Management District – August 1995, accepts responsibility for operation and maintenance of the system. The permit shall not be transferred to such approved operation and maintenance entity until the operation phase of the permit becomes effective. Following inspection and approval of the permitted system by the Department, the permittee shall initiate transfer of permit to the approved responsible operation entity if different from the permittee. Until the permit is transferred pursuant to Rule 62-343.110(1) (d), F.A.C., the permittee shall be liable for compliance with the terms of the permit.

8. Each phase or independent portion of the permitted system must be completed in accordance with the permitted plans and permit conditions prior to the initiation of the permitted use of site infrastructure located within the area served by that portion or phase of the system. Each phase or independent portion of the system must be completed in accordance with the permitted plans and permit conditions prior to transfer of responsibility for operation and maintenance of the phase or portion of the system to a local government or other responsible entity.

9. For those systems that will be operated or maintained by an entity that will require an easement or deed restriction in order to enable that entity to operate or maintain the system in conformance with this permit, such easement or deed restriction must be recorded in the public records and submitted to the Department along with any other final operation and maintenance documents required by Sections 9.0 and 10.0 of the Basis of Review for Environmental Resource Permit Applications Within the South Florida Water Management District – August 1995, prior to lot or unit sales or prior to lot or unit sales or prior to the completion of the system, whichever occurs first. Other documents concerning the establishment and authority of the operation entity must be filed with the Secretary of State where appropriate. For those systems which are proposed to be maintained by the county or municipal entities, final operation and maintenance documents must be received by the Department when maintenance and operation of the system is accepted by the local government entity. Failure to submit the appropriate final documents will result in the permittee remaining liable for carrying out maintenance and operation of the permitted system and any other permit conditions.

10. Should any other regulatory agency require changes to the permitted system, the permittee shall notify the Department in writing of the changes prior to implementation so that a determination can be made whether a permit modification is required.

11. This permit does not eliminate the necessity to obtain any required federal, state, local and special district authorizations prior to the start of any activity approved by this permit. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and Chapter 40E-4 or Chapter 40E-40, F.A.C.

12. The permittee is hereby advised that Section 253.77, F.S. states that a person may not commence any excavation, construction, or other activity involving the use of sovereign or other lands of the state, the title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund without obtaining the required lease, license, easement, or other form of consent authorizing the proposed use. Therefore, the permittee is responsible for obtaining any necessary authorization from the Board of Trustees prior to commencing activity on sovereignty lands or other state owned lands.

13. The permittee is advised that the rules of the South Florida Water Management District require the permittee to obtain a water use permit from the South Florida Water management District prior to construction dewatering, unless the work qualifies for a general permit pursuant to Rule 40E-20.302(4), F.A.C., also known as the “No Notice” rule.

14. The permittee shall hold and save the Department harmless from any and all damages, claims or liabilities which may arise by reason of the construction, alteration, operation, maintenance, removal, abandonment or use of any system authorized by this permit.

15. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered binding unless a specific condition of this permit or a formal determination under Section 373.421(2). F.S., provides otherwise.

16. The permittee shall notify the Department in writing within 30 days of any sale, conveyance, or other transfer of ownership or control of a permitted system or the real property on which the permitted system is located. All transfers of ownership or transfers of a permit are subject to the requirements of Rule 62-343.130, F.A.C. The permittee transferring the permit shall remain liable for corrective actions that may be required as a result of any violations prior to the sale, conveyance or other transfer of the system.

17. Upon reasonable notice to the permittee, Department authorized staff with proper identification shall have permission to enter, inspect, sample and test the system to insure conformity with the plans and specifications approved by the permit.

18. If historical or archaeological artifacts are discovered at any time on the project site, the permittee shall immediately notify the appropriate Department office.

19. The permittee shall immediately notify the Department in writing of and previously submitted information that is later discovered to be inaccurate.

#### **GENERAL CONDITIONS FOR SOVEREIGNTY SUBMERGED LANDS AUTHORIZATION**

Any use of sovereignty submerged lands is subject to the following general conditions are binding upon the permittee and are enforceable under Chapter 253, F.S., and, as applicable, Chapter 258, F.S.:

1. Sovereignty submerged lands may be used only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use will constitute a violation. Violation of the authorization shall result in suspension or revocation of the permittee's use of the sovereignty submerged land unless cured to the satisfaction of the Board of Trustees.

2. Authorization under Rule 18-21.005, F.A.C., convey no title to sovereignty submerged land or water column, nor does it constitute recognition or acknowledgment of any other person's title to such land or water.
3. Authorizations under Rule 18-21.005, F.A.C., may be modified, suspended or revoked in accordance with its terms or the remedies provided in Sections 253.04, F.S., and Chapter 18-14, F.A.C.
4. Structures or activities will be constructed and used to avoid or minimize adverse impacts to resources.
5. Construction, use, or operation of the structure or activity will not adversely affect any species which is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004, and 68A-27.005, F.A.C.
6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity will be modified in accordance with the court's decision.
7. Structures or activities will not create a navigational hazard.
8. Structures will be maintained in a functional condition and will be repaired or removed if they become dilapidated to such an extent that they are no longer functional.
9. Structures or activities will be constructed, operated, and maintained solely for water dependent purposes.
10. The permittee agrees to indemnify, defend and hold harmless the Board of Trustees and the State of Florida from all claims, actions, lawsuits and demands in any form arising out of the authorization to use sovereignty submerged lands or the permittee's use and construction of structures on sovereignty submerged lands. This duty to indemnify and hold harmless will include any and all liabilities that are associated with the structure or activity including special assessments or taxes that are now or in the future assessed against the structure or activity during the period of the authorization.
11. Failure by the Board of Trustees to enforce any violation of a provision of the authorization or waiver by the Board of Trustees of any provision of the authorization will not invalidate the provision not enforced or waived, nor will the failure to enforce or a waiver prevent the Board of Trustees from enforcing the unenforced or waived provision in the event of a violation of that provision.

12. Permittee binds itself and its successors and assigns to abide by the provisions and conditions set forth in the authorization. If the permittee or its successors or assigns fails or refuses to comply with the provisions and conditions of the authorization, the authorization may be terminated by the Board of Trustees after written notice to the permittee or its successors or assigns. Upon receipt of such notice, the permittee or its successors or assigns will have thirty (30) days in which to correct the violations. Failure to correct the violations within this period will result in the automatic revocation of this authorization.

13. All costs incurred by the Board of Trustees in enforcing the terms and conditions of the authorization will be paid by the permittee. Any notice required by law will be made by certified mail at the address shown on page one of the authorization. The permittee will notify the Board of Trustees in writing of any change of address at least ten days before the change becomes effective.

14. This authorization does not allow any activity prohibited in a conservation easement or restrictive covenant that prohibits the activity.

## **NOTICE OF RIGHTS**

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice.

### Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rule 28-106.201, F.A.C., a petition for an administrative hearing must contain the following information:

- (a) The name and address of each agency affected and each agency's file or identification number, if known;
- (b) The name, address, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;

- (c) A statement of when and how the petitioner received notice of the agency decision;
- (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
- (e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action; and
- (f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
- (g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Also, a copy of the petition shall be mailed to the permittee at the address indicated above at the time of filing.

#### Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the permittee must be filed with 14 days of receipt of this written notice. Petitions filed by any persons other than the permittee, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. Under Section 120.60(3), F.S., however, any person who has asked the Department for notice of agency action may file a petition with 14 days of receipt of such notice, regardless of the date of publication. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

#### Extension of Time

Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, before the applicable deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

### Mediation

Mediation is not available in this proceeding.

### FLAWAC Review

The permittee, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when the order is filed with the Clerk of the Department.

### Judicial Review

Any party to this action has the right to seek judicial review pursuant to section 120.68, F.S., by filing a Notice of Appeal pursuant to Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, M.S. 35, Tallahassee, Florida 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal.

[this portion intentionally left blank]

The Notice of Appeal must be filed with 30 days from the date this action is filed with the Clerk of the Department.

Executed in Monroe County, Florida.

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION



For: \_\_\_\_\_

Jon M. Iglehart  
District Director  
South District Office

JMI/ch

**Attachments:**

Project Drawings, 4 pages  
Commencement notice /62-343.900(3)\*  
Annual status report/62-343.900(4)\*  
As-built certification/62-343.900(5)\*  
Inspection certification/62-343.900(6)\*  
Transfer construction to operation phase/ 62-343.900(7)\*  
Application for transfer of an ERP permit/62-343.900(8)\*

\*Can be downloaded at: <http://www.dep.state.fl.us/water/wetlands/erp/forms.htm>

**Copies furnished to:**

U.S. Army Corps of Engineers, Miami /Florida Fish and Wildlife Conservation Commission  
Monroe County Property Appraiser  
Florida Keys National Marine Sanctuary  
Sue Jones & Yanett Langley, FDEP

CERTIFICATE OF SERVICE

The undersigned hereby certifies that this permit and authorization to use sovereignty submerged lands, including all copies, were mailed before the close of business on September 24, 2013, to the above listed persons.

FILING AND ACKNOWLEDGMENT

FILED, on this date, under 120.52(7) of the  
Florida Statutes, with the designated Department Clerk,  
receipt of which is hereby acknowledged.



September 24, 2013

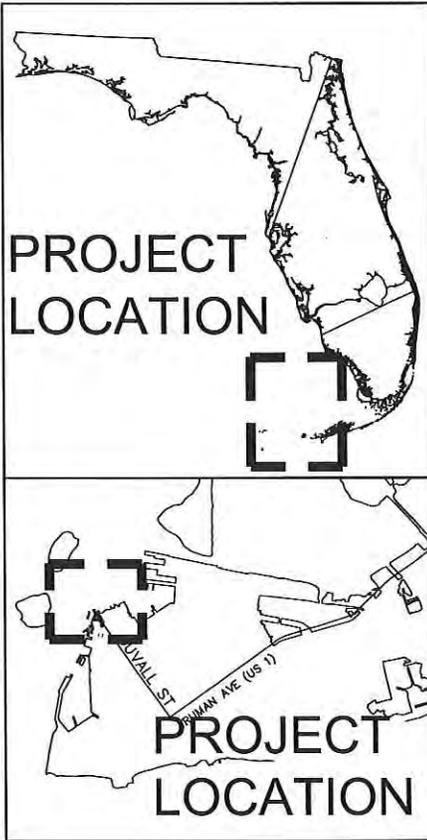
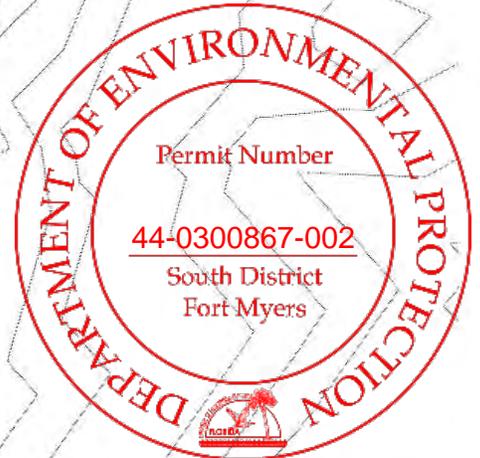
Clerk

Date

Permittee: City of Key West  
Permit No: 44-0300867-002  
Page 14 of 14

Permit Expiration: September 24, 2018

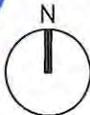
PERMIT DRAWINGS  
NOT FOR CONSTRUCTION



PROJECT  
LOCATION

FLUGCS  
5100

Jon Casey Long  
MAY 01 2013  
Professional Engineer  
State of Florida Registration No. 56083



SCALE: 1"=125'

PLOTTED: -  
TIME: -  
PLOT SCALE: -  
DESIGNED: -  
DRAWN: -  
CHECKED: -  
APPROVED: -  
DATE: -

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA  
PLAN VIEW

**CH2MHILL**

4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No. 439197.B1.01  
CAD FILE  
SHEET NUMBER  
P1  
SHEET OF

PERMIT DRAWINGS  
NOT FOR CONSTRUCTION



-10  
-9  
-8  
-7

EXISTING WOOD DECK TO BE TEMPORARILY REMOVED

EXISTING WOODEN PILES

EXISTING CONCRETE SHEET PILE WALL (TO REMAIN - TYP)

EXISTING OLD STEEL SHEET PILE WALLS (TO REMAIN)

DUVALL ST

Jon Casey Long

MAY 01 2013

Professional Engineer

State of Florida Registration No. 56083



SCALE: 1"=80'

PLOTTED: -  
TIME: -  
PLOT SCALE: -  
DESIGNED: -  
DRAWN: -  
CHECKED: -  
APPROVED: -  
DATE: -

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA

DUVALL STREET BULKHEAD EXISTING CONDITION

**CH2MHILL**

4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No. 439197.B1.01  
CAD FILE  
SHEET NUMBER  
**P2**  
SHEET OF



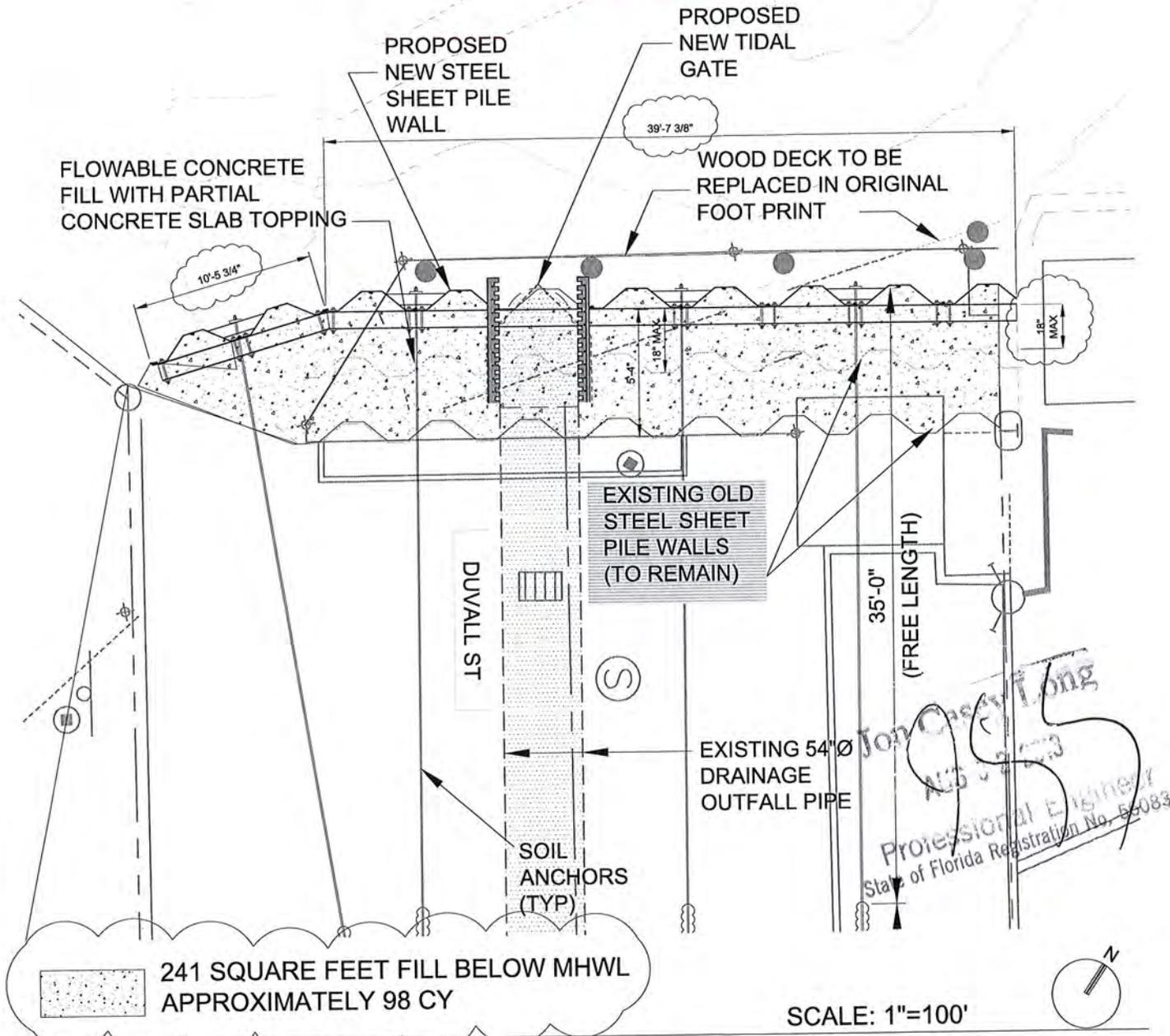
PERMIT DRAWINGS  
NOT FOR CONSTRUCTION

RECEIVED

AUG 22 2013

D.E.P. Marathon

REVISED



241 SQUARE FEET FILL BELOW MHWL  
APPROXIMATELY 98 CY

SCALE: 1"=100'



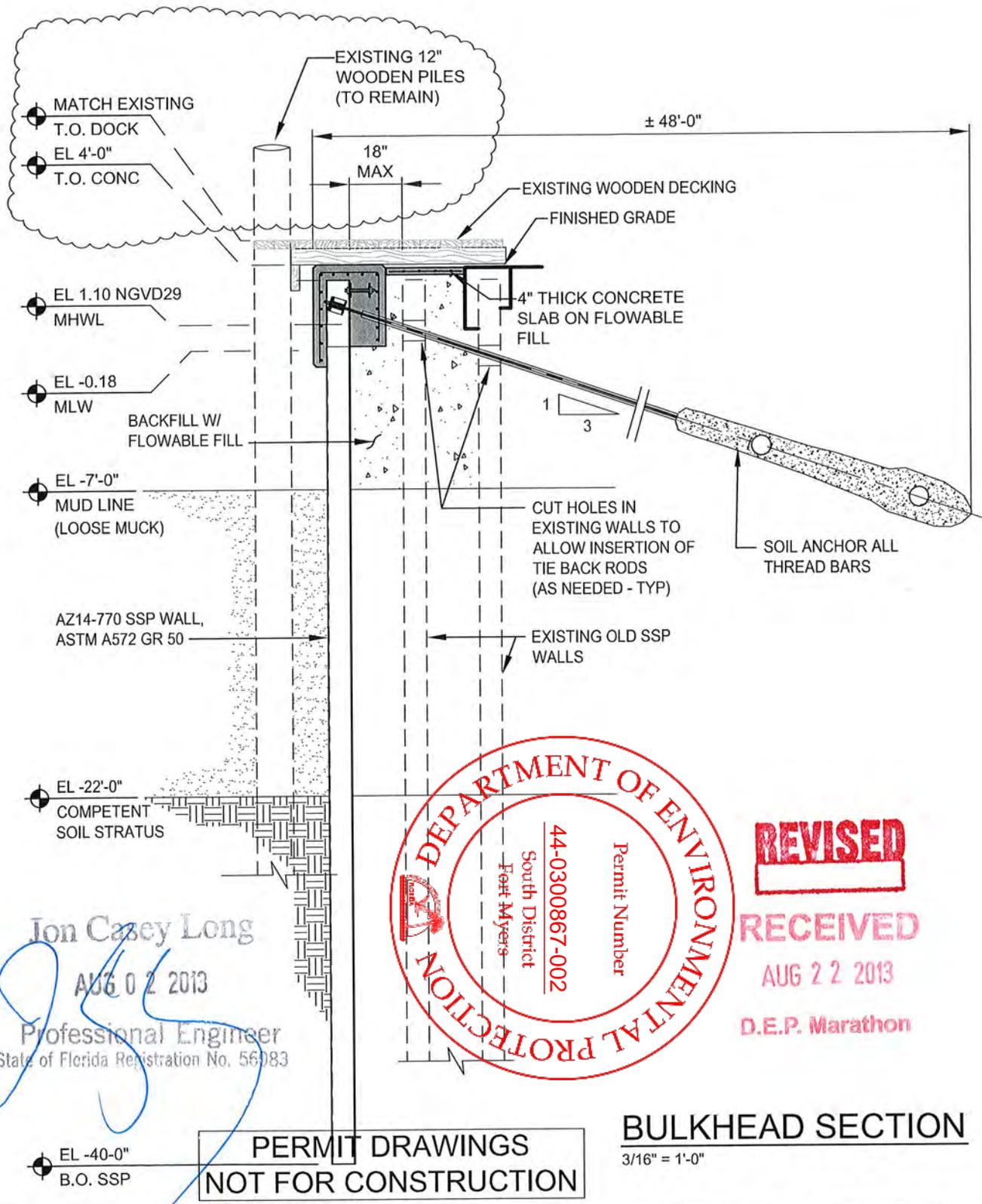
PLOTTED:	-
TIME:	-
PLOT SCALE:	-
DESIGNED:	-
DRAWN:	-
CHECKED:	-
APPROVED:	-
DATE:	-

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA  
DUVALL STREET BULKHEAD PLAN VIEW

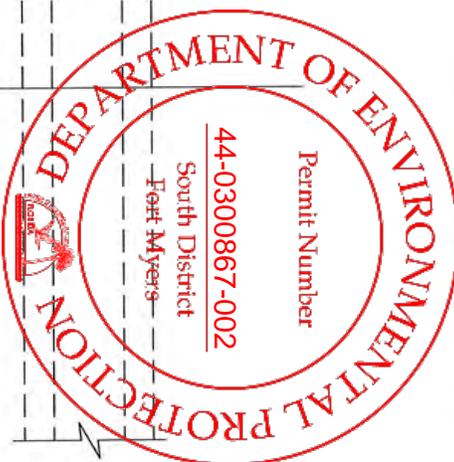
**CH2MHILL**  
4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No. 439197.B1.01  
CAD FILE  
SHEET NUMBER  
P3  
SHEET OF

*Joy Chesney Long*  
Professional Engineer  
State of Florida Registration No. 55083



Jon Casey Long  
 AUG 02 2013  
 Professional Engineer  
 State of Florida Registration No. 56083



**REVISED**  
**RECEIVED**  
 AUG 22 2013  
 D.E.P. Marathon

**PERMIT DRAWINGS**  
**NOT FOR CONSTRUCTION**

**BULKHEAD SECTION**  
 3/16" = 1'-0"

PLOTTED: - TIME: - PLOT SCALE: - DESIGNED: - DRAWN: - CHECKED: - APPROVED: - DATE: -	Duval Bulkhead Repair CITY OF KEY WEST KEY WEST, FLORIDA DUVALL STREET BULKHEAD SECTION	<b>CH2MHILL</b> 4350 W Cypress Suite # 600 Tampa, Florida 33607	JOB No. 439197.B1.01 CAD FILE CAD FILE SHEET NUMBER <b>P4</b> SHEET OF
---	--	---	---



**DEPARTMENT OF THE ARMY**  
JACKSONVILLE DISTRICT CORPS OF ENGINEERS  
9900 SOUTHWEST 107<sup>TH</sup> AVENUE, SUITE 203  
MIAMI, FLORIDA 33176

REPLY TO  
ATTENTION OF

Regulatory Division  
South Permits Branch  
Miami Permits Section  
SAJ-2013-01387 (NW-IF)

NOV 21 2013

City of Key West  
c/o Bogdan Vitas Jr., City Manager  
3132 Flagler Ave  
Key West, FL 33040

Dear Mr. Bogdan:

The U.S. Army Corps of Engineers (Corps) assigned your application for a Department of the Army (DA) permit, which the Corps received on May 10, 2013, the file number SAJ-2013-01387 (NW-IF). A review of the information and drawings provided indicates that the proposed work would result in the repair/rehabilitation of an existing, dilapidated steel sheetpile bulkhead; specifically, to remove the deckboards and stringers associated with an existing marginal wood dock (dock support piles will remain in-place); to install 50 linear feet of new cantilevered steel king sheetpile bulkhead and associated concrete cap 18 inches waterward of the original dilapidated bulkhead; place 98 cubic yards of backfill within a 241 square-foot area landward of the new bulkhead; replace the marginal dock deckboards and stringers within the previously existing footprint after the new bulkhead is installed; and temporarily deploy turbidity curtains for the duration of all in-water activities.

The project is located at the northern end of Duval Street adjacent to the Man of War Harbor at 402 Wall Street; in Section 31, Township 67 South, Range 25 East in Key West, Monroe County, Florida 33041 (SSLL# 44026265).

Your project, as depicted on the enclosed drawings, is authorized by Nationwide Permit (NWP) Number 3. In addition, project specific conditions have been enclosed. This verification is valid until **March 18, 2017**. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. Please access the U.S. Army Corps of Engineers, Jacksonville District's Regulatory Internet page to access Internet links to view the Final Nationwide Permits, Federal Register Vol. 77, dated February 21, 2012, specifically pages 10270 – 10290, the Corrections to the Final Nationwide Permits, Federal Register 77, March 19, 2012, and the List of Regional Conditions. The Internet page address is:

<http://www.saj.usace.army.mil/Missions/Regulatory.aspx>

Please be aware this Internet address is case sensitive and should be entered as it appears above. Once there you will need to click on "Source Book"; and, then click on "Nationwide Permits." These files contain the description of the Nationwide Permit authorization, the Nationwide Permit general conditions, and the regional conditions, which apply specifically to this verification for NWP 3. Enclosed is a list of the six General Conditions, which apply to all DA authorizations. You must comply with all of the special and general conditions and any project specific condition of this authorization or you may be subject to enforcement action. In the event you have not completed construction of your project within the specified time limit, a separate application or re-verification may be required.

The following special conditions are included with this verification:

1. **Self-Certification:** Within 60 days of completion of the work authorized, the attached *Self-Certification Statement of Compliance* must be completed and submitted to the U.S. Army Corps of Engineers. Mail the completed form to the Regulatory Division, Special Projects and Enforcement Branch, 9900 Southwest 107<sup>th</sup> Avenue, Suite 203, Miami, Florida 33176. The Permittee shall reference this permit number, SAJ-2013-01387 (NW-IF), on all submittals.

2. **Best Management Practices:** Environmental controls and best management practices must be implemented to properly contain construction materials and prevent fugitive particulates from entering surrounding waters during the construction of the project.

3. **Manatee Conditions:** The Permittee shall comply with the "Standard Manatee Conditions for In-Water Work – 2011," attached to this permit.

4. **Sea Turtle and Smalltooth Sawfish Conditions:** The Permittee shall comply with National Marine Fisheries Service's "Sea Turtle and Smalltooth Sawfish Construction Conditions," dated March 23, 2006, attached to this permit.

5. **Posting of permit:** The Permittee shall ensure that all contractors, sub-contractors, and entities associated with the implementation of the project review, understand, and comply with the approved plans and special conditions made part of this permit. Complete copies of the permit and approved plans shall be available at the construction site at all times. Failure to comply with the approved plans and permit special conditions may subject the Permittee to enforcement action.

6. **Florida Fish and Wildlife Conservation Commission (FWC) Condition:** No later than 60 days after construction commencement, permanent manatee educational signs must be installed by the permittee/lessee. In the event the signs fade, become damaged or outdated, they must be replaced and maintained for the life of the facility. The on-site locations and types of signs must be acceptable to the FWC, which should be contacted at [ImperiledSpecies@myfwc.com](mailto:ImperiledSpecies@myfwc.com) <<mailto:ImperiledSpecies@myfwc.com>> . The types of signs, sign vendors, and the process for FWC approval can be found at: <http://www.myfwc.com/wildlifehabitats/managed/manatee/signs/>.

## **7. Cultural Resources/Historic Properties:**

a. No structure or work shall adversely affect impact or disturb properties listed in the National Register of Historic Places (NRHP) or those eligible for inclusion in the NRHP.

b. If during the ground disturbing activities and construction work within the permit area, there are archaeological/cultural materials encountered which were not the subject of a previous cultural resources assessment survey (and which shall include, but not be limited to: pottery, modified shell, flora, fauna, human remains, ceramics, stone tools or metal implements, dugout canoes, evidence of structures or any other physical remains that could be associated with Native American cultures or early colonial or American settlement), the Permittee shall immediately stop all work and ground-disturbing activities within a 100-meter diameter of the discovery and notify the Corps within the same business day (8 hours). The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions.

c. Additional cultural resources assessments may be required of the permit area in the case of unanticipated discoveries as referenced in accordance with the above Special Condition ; and if deemed necessary by the SHPO, THPO(s), or Corps, in accordance with 36 CFR 800 or 33 CFR 325, Appendix C (5). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume on non-federal lands without written authorization from the SHPO for finds under his or her jurisdiction, and from the Corps.

d. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work and ground disturbing activities within a 100-meter diameter of the unmarked human remains shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist within the same business day (8-hours). The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist and from the Corps.

**8. Regulatory Agency Changes:** Should any other regulatory agency require changes to the work authorized or obligated by this permit, the Permittee is advised that a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee's responsibility to request a modification of this permit from the Miami Regulatory Office.

This letter of authorization does not include conditions that would prevent the 'take' of a state-listed fish or wildlife species. These species are protected under sec. 379.411, Florida Statutes, and listed under Rule 68A-27, Florida Administrative Code. With regard to fish and wildlife

species designated as species of special concern or threatened by the State of Florida, you are responsible for coordinating directly with the Florida Fish and Wildlife Conservation Commission (FWC). You can visit the FWC license and permitting webpage (<http://www.myfwc.com/license/wildlife/>) for more information, including a list of those fish and wildlife species designated as species of special concern or threatened. The Florida Natural Areas Inventory (<http://www.fnai.org/>) also maintains updated lists, by county, of documented occurrences of those species.

This letter of authorization does not give absolute Federal authority to perform the work as specified on your application. The proposed work may be subject to local building restrictions mandated by the National Flood Insurance Program. You should contact your local office that issues building permits to determine if your site is located in a flood-prone area, and if you must comply with the local building requirements mandated by the National Flood Insurance Program.

If you are unable to access the internet or require a hardcopy of any of the conditions, limitations, or expiration date for the above referenced NWP, please contact Ivan Fannin by telephone at 305-779-6053.

Thank you for your cooperation with our permit program. The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to visit <http://per2.nwp.usace.army.mil/survey.html> and complete our automated Customer Service Survey. Your input is appreciated – favorable or otherwise. Again, please be aware this Internet address is case sensitive and should be entered as it appears above.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ivan Fannin', with a stylized flourish at the end.

Ivan Fannin  
Project Manager

Enclosures:

1. General Conditions
2. Standard Manatee Conditions for In-Water Work
3. Sea Turtle and Smalltooth Sawfish Construction Conditions
4. Self-Certification
5. ACOE site plans date-stamped 11/21/2013
6. Transfer Request

Copy/ies Furnished:

1. Benjamin Brice, CH2M Hill, agent (email)
2. CESAJ-RD-PE

GENERAL CONDITIONS

33 CFR PART 320-330

PUBLISHED FEDERAL REGISTER DATED 13 NOVEMBER 1986

1. The time limit for completing the work authorized ends on **March 18, 2017**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort of if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow a representative from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

**STANDARD MANATEE CONDITIONS FOR IN-WATER WORK**  
2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

- a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.
- b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
- d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.
- e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida, and to FWC at [ImperiledSpecies@myFWC.com](mailto:ImperiledSpecies@myFWC.com)
- f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at [MyFWC.com/manatee](http://MyFWC.com/manatee). Questions concerning these signs can be sent to the email address listed above.

# CAUTION: MANATEE HABITAT

**All project vessels**

## **IDLE SPEED / NO WAKE**

When a manatee is within 50 feet of work  
all in-water activities must

## **SHUT DOWN**

Report any collision with or injury to a manatee:



**Wildlife Alert:**

**1-888-404-FWCC(3922)**

cell \*FWC or #FWC



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Southeast Regional Office  
263 13th Avenue South  
St. Petersburg, FL 33701

## SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

- a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.
- b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.
- c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.
- d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.
- e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.
- f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.
- g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006

O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc



**SELF-CERTIFICATION STATEMENT OF COMPLIANCE**

**Permit Number: SAJ-2013-01387 (NW-IF)**

Permittee's Name & Address (please print or type): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Telephone Number: \_\_\_\_\_

Location of the Work: \_\_\_\_\_

\_\_\_\_\_

Date Work Started: \_\_\_\_\_ Date Work Completed: \_\_\_\_\_

Description of the Work (e.g. bank stabilization, residential or commercial filling, docks, dredging, etc.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acreage or Square Feet of Impacts to Waters of the United States: \_\_\_\_\_

Describe Mitigation completed (if applicable): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Describe any Deviations from the Permit (attach drawing(s) depicting the deviations):

\_\_\_\_\_  
\_\_\_\_\_

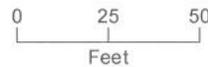
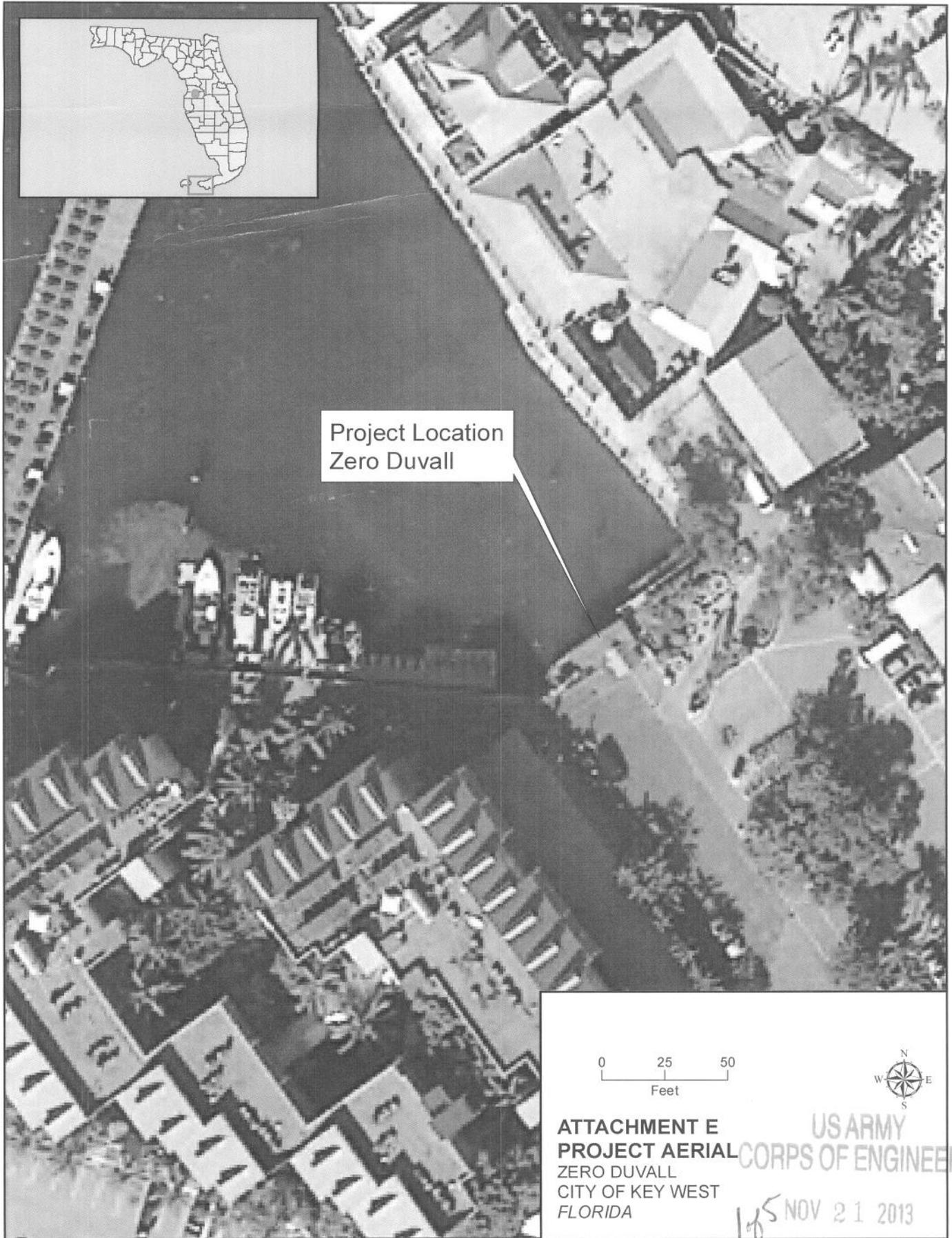
I certify that all work, and mitigation (if applicable), was done in accordance with the limitations and conditions as described in the permit. Any deviations as described above are depicted on the attached drawing(s).

\_\_\_\_\_  
Signature of Permittee

\_\_\_\_\_  
Date



Project Location  
Zero Duvall



ATTACHMENT E  
PROJECT AERIAL  
ZERO DUVALL  
CITY OF KEY WEST  
FLORIDA

US ARMY  
CORPS OF ENGINEERS

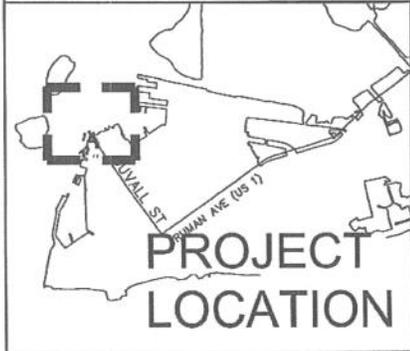
105 NOV 21 2013

CH2MHILL  
MIAMI REGULATORY OFFICE

COE #: 2013-01387  
PROJECT MANAGER: TWF

PERMIT DRAWINGS  
NOT FOR CONSTRUCTION

PROJECT  
LOCATION



PROJECT  
LOCATION

PROJECT  
LOCATION

US ARMY  
CORPS OF ENGINEERS

NOV 21 2013

2065

MIAMI REGULATORY OFFICE

COE #: 2013-01387  
PROJECT MANAGER: JCF

Jon Casey Long

MAY 01 2013

Professional Engineer  
State of Florida Registration No. 56083



SCALE: 1"=125'

FLUCCS  
5100

DUVALL ST

PLOTTED: -  
TIME: -  
PLOT SCALE: -  
DESIGNED: -  
DRAWN: -  
CHECKED: -  
APPROVED: -  
DATE: -

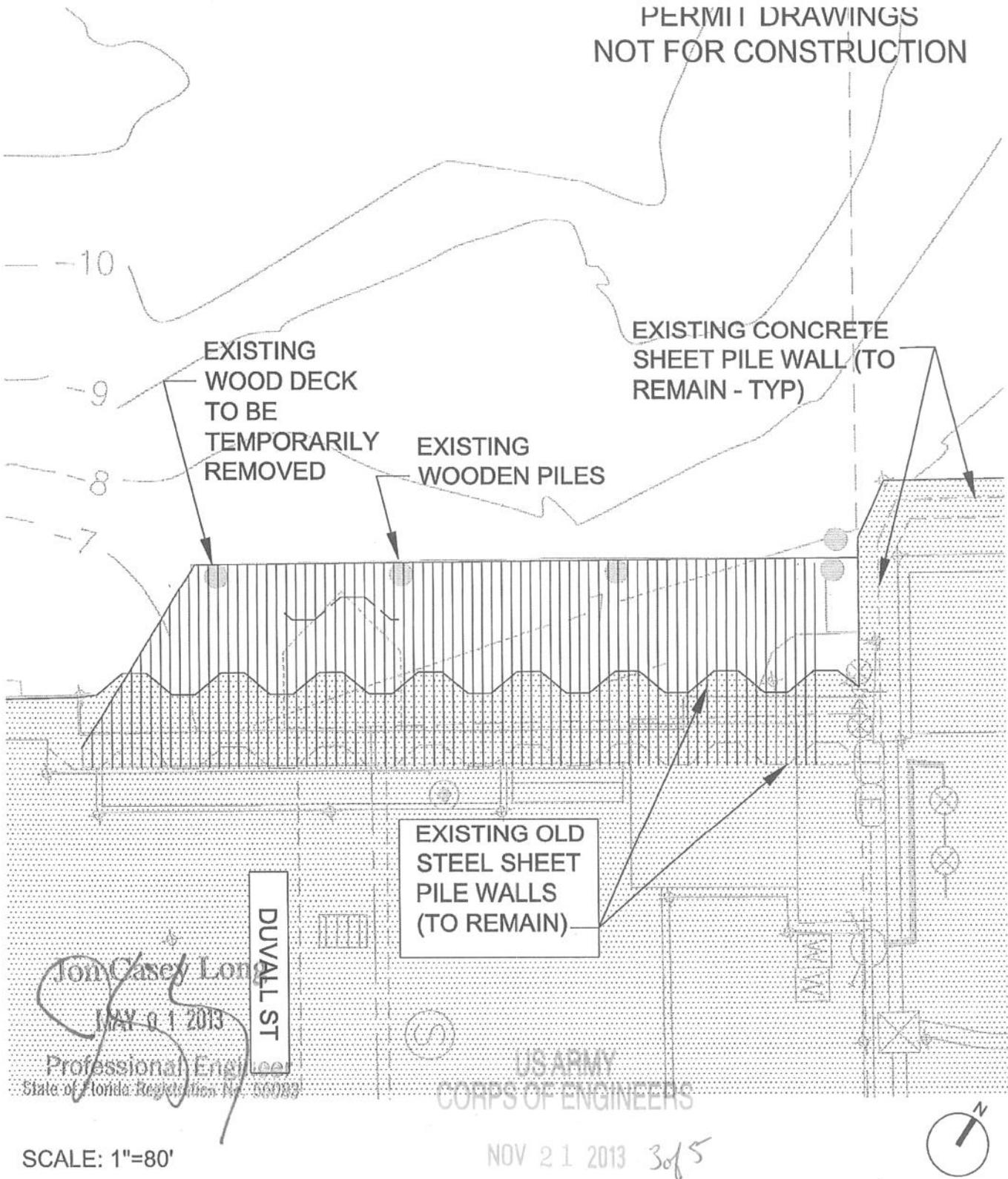
Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA  
PLAN VIEW

**CH2MHILL**

4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No. 439197.B1.01  
CAD FILE  
SHEET NUMBER  
P1  
SHEET OF

PERMIT DRAWINGS  
NOT FOR CONSTRUCTION



SCALE: 1"=80'

NOV 21 2013 3 of 5

PLOTTED:	-
TIME:	-
PLOT SCALE:	-
DESIGNED:	-
DRAWN:	-
CHECKED:	-
APPROVED:	-
DATE:	-

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA

DUVALL STREET BULKHEAD EXISTING CONDITION

MIAMI REGULATORY OFFICE

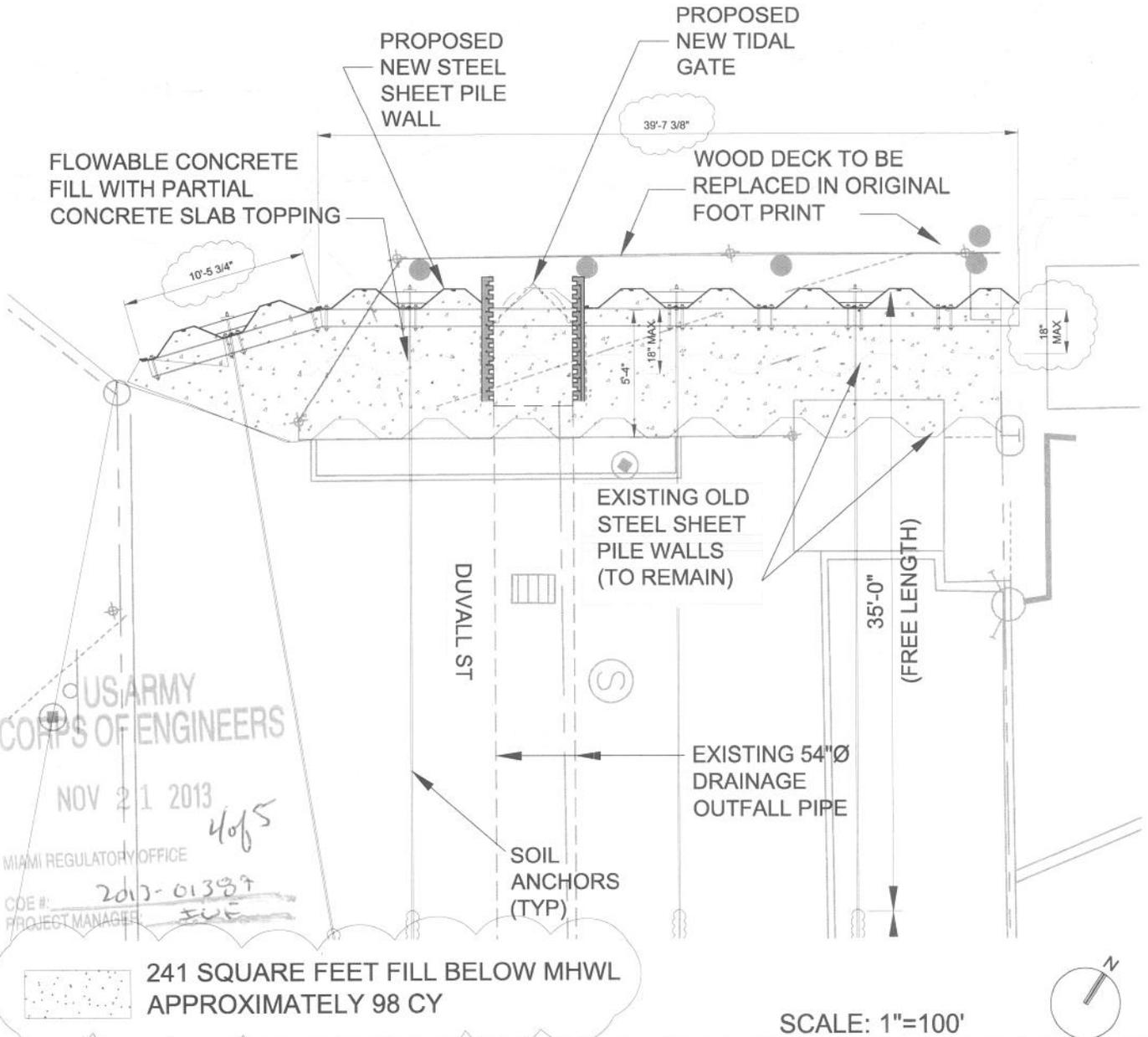
COE #: 2013-01387  
PROJECT MANAGER: JLF

**CH2MHILL**

4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No.	439197.B1.01
CAD FILE	CAD FILE
SHEET NUMBER	P2
SHEET OF	OF

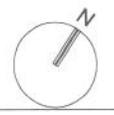
PERMIT DRAWINGS  
NOT FOR CONSTRUCTION



US ARMY  
CORPS OF ENGINEERS  
NOV 21 2013  
MIAMI REGULATORY OFFICE  
COE #: 2013-01387  
PROJECT MANAGER: JUE

241 SQUARE FEET FILL BELOW MHWL  
APPROXIMATELY 98 CY

SCALE: 1"=100'

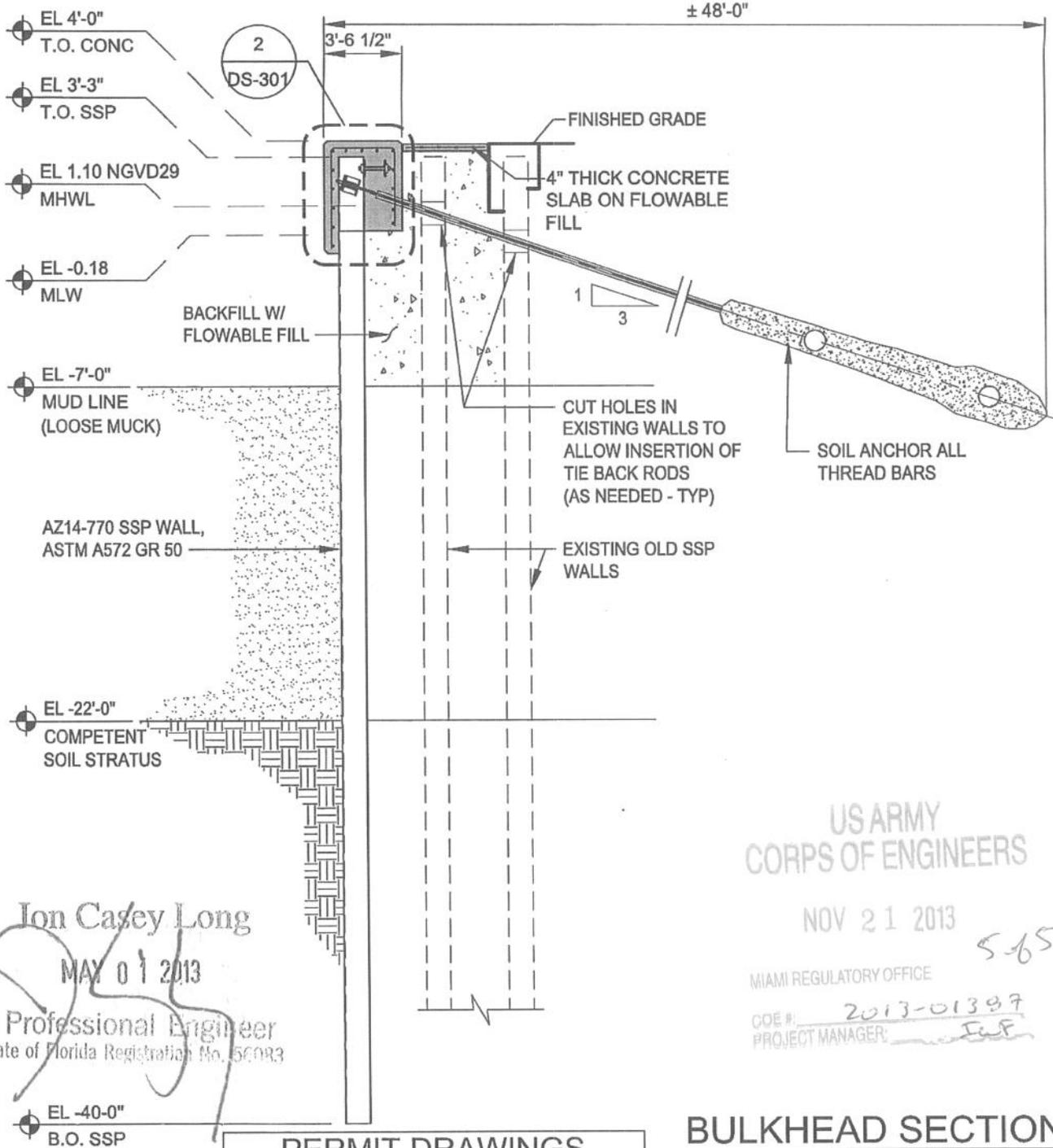


PLOTTED:	-
TIME:	-
PLOT SCALE:	-
DESIGNED:	-
DRAWN:	-
CHECKED:	-
APPROVED:	-
DATE:	-

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA  
DUVALL STREET BULKHEAD PLAN VIEW

**CH2MHILL**  
4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No.	4.39197.B1.01
CAD FILE	CAD FILE
SHEET NUMBER	P3
SHEET	OF



US ARMY  
CORPS OF ENGINEERS

NOV 21 2013

MIAMI REGULATORY OFFICE

COE #: 2013-01397  
PROJECT MANAGER: JLF

565

Ion Casey Long  
MAY 01 2013  
Professional Engineer  
State of Florida Registration No. 56083

PERMIT DRAWINGS  
NOT FOR CONSTRUCTION

**BULKHEAD SECTION**  
3/16" = 1'-0"

PLOTTED:	-
TIME:	-
PLOT SCALE:	-
DESIGNED:	-
DRAWN:	-
CHECKED:	-
APPROVED:	-
DATE:	-

Duval Bulkhead Repair  
CITY OF KEY WEST  
KEY WEST, FLORIDA  
DUVALL STREET BULKHEAD SECTION

**CH2MHILL**  
4350 W Cypress  
Suite # 600  
Tampa, Florida  
33607

JOB No. 439197.B1.01  
CAD FILE  
CAD FILE  
SHEET NUMBER  
**P4**  
SHEET OF

**DEPARTMENT OF THE ARMY PERMIT TRANSFER REQUEST**

**PERMIT NUMBER: SAJ-2013-01387 (NW-IF)**

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. Although the construction period for works authorized by Department of the Army permits is finite, the permit itself, with its limitations, does not expire.

To validate the transfer of this permit and the associated responsibilities associated with compliance with its terms and conditions, have the transferee sign and date below and mail to the U.S. Army Corps of Engineers, Enforcement Section, Post Office Box 4970, Jacksonville, FL 32232-0019.

\_\_\_\_\_  
**(TRANSFEEE-SIGNATURE)**

\_\_\_\_\_  
**(SUBDIVISION)**

\_\_\_\_\_  
**(DATE)**

\_\_\_\_\_  
**(LOT)**

\_\_\_\_\_  
**(BLOCK)**

\_\_\_\_\_  
**(NAME-PRINTED)**

\_\_\_\_\_  
**(STREET ADDRESS)**

\_\_\_\_\_  
**(MAILING ADDRESS)**

\_\_\_\_\_  
**(CITY, STATE, ZIP CODE)**