

# PROJECT MANUAL FOR:



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## ITB BID No.: 15-022 TRUMAN WATERFRONT PARK PHASE 1A

SEPTEMBER 2015

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PREPARED FOR:  
City Of Key West  
Engineering Services

CITY OF KEY WEST

KEY WEST, FLORIDA

CONTRACT DOCUMENTS

for

TRUMAN WATERFRONT PARK PHASE 1A

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KEY WEST, FLORIDA

SEPTEMBER 2015

ITB BID No.: 15-022

**INFORMATION TO BIDDERS**

SUBJECT: INVITATION TO BID No. 15-022:  
TRUMAN WATERFRONT PARK PHASE 1A

ISSUE DATE: AUGUST 30, 2015

MAIL OR SPECIAL  
DELIVERY REPOSSES TO: CITY CLERK  
CITY OF KEY WEST  
3126 FLAGLER AVE  
KEY WEST, FL 33040

DELIVER BIDS TO: SAME AS ABOVE

BIDS MUST BE  
RECEIVED: WEDNESDAY SEPTEMBER 30, 2015

NOT LATER THAN: 3:00 P.M. LOCAL TIME

SUE SNIDER  
PURCHASING AGENT  
CITY OF KEY WEST

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**PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

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**PART 1**

**BIDDING REQUIREMENTS**

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## INVITATION TO BID

Sealed bids for the City of Key West ITB No.15-022 TRUMAN WATERFRONT PARK PHASE 1A, addressed to the City of Key West, will be received at the Office of the City Clerk, 3126 Flagler St., Key West Florida, 33040 until 3:00 pm on September 30, 2015 and then will be publicly opened and read. Any bids received after the time and date specified will not be considered.

**Please submit one (1) one original and (2) two flash drives with one single PDF file of the entire bid package. Bid package is to be enclosed in a sealed envelope, clearly marked on the outside “BID FOR TRUMAN WATERFRONT PARK PHASE 1A ITB No. 15-022” addressed and delivered to the City Clerk at the address noted above.**

The project includes, but is not limited to, the management and disposal of encountered contaminated groundwater and soil, site work, utility work, construction of roadways, parking lots, a restroom building, an interactive water feature, playgrounds and associated safety surface, shade sails, pedestrian paths, retaining walls, site lighting, landscape and irrigation.

Drawings and Specifications may be obtained from Demand Star by Onvia or City of Key West website <http://www.cityofkeywest-fl.gov/egov/apps/document/center.egov?view=item:id=5100>. For bid package access on Demand Star, please contact Onvia at [www.demandstar.com](http://www.demandstar.com) or call 1-800-711-1712.

**A MANDATORY pre-bid meeting** will be held in the conference room at the NOAA Florida Keys Eco-Discovery Center located at 35 East Quay Road, Key West, FL 33040 on **Wednesday September 9<sup>th</sup>, 2015 at 1:30 p.m.**

The successful Bidder may be required to furnish the necessary additional bond(s) for the faithful performance of the Contract, as prescribed in the Bidding Documents. The Bidder will be required to furnish documentation showing that he is in compliance with the licensing requirements of the State and the provisions of Chapter 66 section 87 of the Code of Ordinances of the City of Key West. Compliance with these provisions is required before the Contractor can enter into the agreement contained in the Contract Documents. Specifically, Bidder shall demonstrate that he holds, as a minimum, the following licenses and certificates required by State Statute and local codes.

**EACH BID MUST BE SUBMITTED ON THE PRESCRIBED FORM AND ACCOMPANIED BY BID SECURITY AS PRESCRIBED IN THE INSTRUCTIONS TO BIDDERS, PAYABLE TO THE CITY OF KEY WEST, FLORIDA, IN AN AMOUNT NOT LESS THAN FIVE (5) PERCENT OF THE AMOUNT BID.**

**THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.**

The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of the provisions of Chapter 66 Section 87 of the Code of Ordinances of the City of Key West; within 10 days following the Notice of Award and must demonstrate that he holds at a minimum, the following licenses & certificates;

- A. City of Key West Business Tax License Receipt
- B. A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida.

**INVITATION TO BID (continued)**

All bid bonds, contract bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or Insurance Company having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida.

Before a Contract will be awarded for the work contemplated herein, the CITY will conduct such investigation as is necessary to determine the performance record and ability of the apparent low Bidder to perform the size and type of work specified under this Contract. Upon request, the Bidder shall submit such information as deemed necessary by the CITY to evaluate the Bidder's qualifications.

For information concerning the proposed work or for appointment to visit the site of the proposed work, contact Jim Bouquet, Engineering Services Department for the City of Key West at (305) 809-3962 or [jbouquet@cityofkeywest-fl.gov](mailto:jbouquet@cityofkeywest-fl.gov).

As stated above at the time of the bid submittal the Bidder must provide satisfactory documentation of State Licenses. The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of County, and City licenses as would be required within ten days of the award. The successful Bidder must also be able to satisfy the City Attorney as to such insurance coverage and legal requirements as may be demanded by the Bid in question. The City may reject bids for any and/or all of the following reasons: (1) for budgetary reasons, (2) if the bidder misstates or conceals a material fact in its bid, (3) if the bid does not strictly conform to the law or is non-responsive to the bid requirements, (4) if the bid is conditional, (5) if a change of circumstances occurs making the purpose of the bid unnecessary to the City, or (6) if such rejection is in the best interest of the City. The City may also waive any minor formalities or irregularities in any bid.

\* \* \* \* \*

## INSTRUCTIONS TO BIDDERS

### 1. CONTRACT DOCUMENTS

#### A. FORMAT

The Contract Documents are divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the sections into work performed by the various building trades, work by separate subcontractors, or work required for separate facilities in the project.

#### B. DOCUMENT INTERPRETATION

The separate sections contained within these Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the proposed work.

Should there be any doubt as to the meaning or intent of said Contract Documents, the Bidder should request of Jim Bouquet, [jbouquet@cityofkeywest-fl.gov](mailto:jbouquet@cityofkeywest-fl.gov), in writing (at least 10 working days prior to bid opening) an interpretation thereof. Any interpretation or change in said Contract Documents will be made only in writing in the form of Addenda to the documents which will be furnished to all registered holders of Contract Documents. Bidders shall submit with their Proposals, or indicate receipt of, all Addenda. The CITY will not be responsible for any other explanation or interpretations of said Documents.

### 2. GENERAL DESCRIPTION OF THE PROJECT

A general description of the work to be done is contained in the Invitation to Bid. The scope is specified in applicable parts of these Contract Documents.

### 3. QUALIFICATION OF CONTRACTORS

The prospective Bidders must meet the statutorily prescribed requirements before award of Contract by the CITY. Bidders must hold or obtain all licenses and/or certificates as required by the State and Local Statutes in order to bid and perform the work specified herein.

### 4. BIDDER'S UNDERSTANDING

Each Bidder must inform himself of the conditions relating to the execution of the work, and it is assumed that he will inspect the site and make himself thoroughly familiar with all the Contract Documents. Failure to do so will not relieve the successful Bidder of his obligation to enter into a Contract and complete the contemplated work in strict accordance with the Contract Documents. It shall be the Bidder's obligation to verify for himself and to his complete satisfaction all information concerning site and subsurface conditions.

## INSTRUCTIONS TO BIDDERS (continued)

The CITY will make available to prospective Bidders upon request and at the office of the CITY Engineer, prior to bid opening, any information that he may have as to subsurface conditions and surface topography at the worksite.

Each Bidder shall inform himself of, and the Bidder awarded a Contract shall comply with, federal, state, and local laws, statutes, and ordinances relative to the execution of the work. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, nondiscrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non-burning requirements, permits, fees, and similar subjects.

### 5. TYPE OF PROPOSAL

#### A. LUMP SUM

The Proposal for the work is to be submitted on a lump sum basis. Lump sum prices shall be submitted for each of the three (3) Notice to Proceeds (NTP) and cumulative total. . All items required to complete the work specified but not included in the Proposal shall be considered incidental to those set forth in the Proposal.

**The Bidder shall submit a Schedule of Values for each NTP with the Proposal. It shall be broken down by bid items listed in the PROPOSAL to be used as a basis for payment.**

### 6. PREPARATION OF BIDS

#### A. GENERAL

All blank spaces in the BID form must be filled in, as required, preferably in BLACK ink. All price information shall be shown in both words and figures where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in case of discrepancy between the amounts stated in writing and the amounts stated in figures. In case of discrepancy between individual lump sum prices and extended totals, unit prices shall prevail.

Any BID shall be deemed informal which contains omissions, erasures, alterations, or additions of any kind, or prices uncalled for, or in which any of the prices are obviously unbalanced, or which in any manner shall fail to conform to the conditions of the published Invitation to Bid.

## INSTRUCTIONS TO BIDDERS (continued)

Only one BID from any individual, firm, partnership, or corporation, under the same or different names, will be considered. Should it appear to the CITY that any Bidder is interested in more than one Proposal for work contemplated; all Proposals in which such Bidder is interested will be rejected.

### B. SIGNATURE

The Bidder shall sign his BID in the blank space provided therefore. If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign Contracts on behalf of the corporation. If Bidder is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign Contracts in behalf of the partnership. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a notarized power-of-attorney must be on file with the CITY prior to opening of Proposals or submitted with the Proposal, otherwise the Proposal will be regarded as not properly authorized.

### C. SPECIAL BIDDING REQUIREMENTS

The Bidder's attention is brought to the hiring practices and licenses and permits of the City of Key West. These are defined in the addition to Article 39, ORDINANCES, PERMITS, AND LICENSES, as set forth in the Supplementary Conditions.

The Bidder shall submit with an experience record with the Bid showing his experience and expertise in general civil and park construction work including, but limited to, management and disposal of contaminated groundwater and soil and construction of site work, roadways, parking lots, playgrounds, safety surfacing, shade sails, furniture landscape and irrigation. Such experience record shall provide at least five current or recent projects of similar work, within the State Florida and preferably Monroe County. For each project the following information shall be provided:

1. Description and location of work.
2. Contract amount.
3. Dates work was performed.
4. Owner.
5. Name of Owner's contact person and phone number.
6. Engineer.
7. Name of Engineer's contact person and phone number.

The bidder shall submit with his bid a list of items to be performed by his own labor and that performed by subcontractors or others.

**INSTRUCTIONS TO BIDDERS (continued)**

D. **ATTACHMENTS**

Bidder shall complete and submit the following forms with his bid:

Anti-Kickback Affidavit  
 Public Entity Crimes Form  
 Indemnification Form  
 Local Vendor Certification  
 City of Key West Business License Tax Receipt  
 Domestic Partnership Affidavit  
 Cone of Silence Affidavit  
 Bidder's Checklist

E. **PUBLIC ENTITY CRIMES FORM**

Pursuant to the requirements of Chapter 287.133, Laws of Florida, pertaining to the sworn statement on Public Entity Crimes and the Convicted Vendor List, all Bidders shall submit a signed and notarized statement with their Bid on the form provided herein.

7. **STATE AND LOCAL SALES AND USE TAXES**

Unless the Supplementary Conditions contains a statement that the CITY is exempt from state sales tax on materials incorporated into the work due to the qualification of the work under this Contract, the Contractor, as required by the laws and statutes of the state and its political subdivisions, shall pay all state and local sales and use taxes. Prices quoted in the Proposal shall include all nonexempt sales and use taxes, unless provision is made in the Proposal form to separately itemize the tax.

8. **SUBMISSION OF BIDS**

All BIDS must be submitted not later than the time prescribed, at the place, and in the manner set forth in the Invitation to Bid. BIDS must be made on the BID forms provided herewith, **submit one (1) ORIGINAL bid package and two (2) FLASH DRIVES containing a single PDF file of the entire bid package.**

Each BID must be submitted in a sealed envelope, so marked as to indicate the Bidder's name and its contents (project name and number) without being opened, and addressed in conformance with the instructions in the Invitation to Bid.

**INSTRUCTIONS TO BIDDERS (continued)****9. MODIFICATION OR WITHDRAWAL OF BIDS**

Prior to the time and date designated for receipt of BIDS, any BID submitted may be withdrawn by notice to the party receiving BIDS at the place designated for receipt of BIDS. Such notice shall be in writing over the signature of the Bidder or by telegram. If by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of BID. No BID may be withdrawn after the time scheduled for opening of BIDS, unless the time specified in paragraph AWARD OF CONTRACT of these Instructions to Bidders shall have elapsed.

**10. BID SECURITY**

BIDS must be accompanied by cash, a certified check, or cashier's check drawn on a bank in good standing, or a bid bond issued by a Surety authorized to issue such bonds in the state where the work is located, in the amount of five (5) percent of the total amount of the Proposal submitted. This bid security shall be given as a guarantee that the Bidder will not withdraw his BID for a period of ninety (90) days after bid opening, and that if awarded the Contract, the successful Bidder will execute the attached Contract and furnish properly executed Performance and Payment Bonds, each in the full amount of the Contract price within the time specified. Agent and Surety phone numbers must be provided.

The Attorney-in-Fact who executes this bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond. Where State Statute requires, certification by a resident agent shall also be provided.

If the Bidder elects to furnish a Bid Bond, he shall use the Bid Bond form bound herewith, or one conforming substantially thereto in form and content.

**11. RETURN OF BID SECURITY**

Within 15 days after the award of the Contract, the CITY will return the bid securities to all Bidders who's BIDS are not to be further considered in awarding the Contract. Retained bid securities will be held until the Contract has been finally executed, after which all bid securities, other than Bidders' bonds and any guarantees, which have been forfeited, will be returned to the respective Bidders whose Proposals they accompanied.

**INSTRUCTIONS TO BIDDERS (continued)**12. **AWARD OF CONTRACT**

Within sixty (60) calendar days after the opening of Proposals, the CITY will accept one of the Proposals or will act in accordance with the following paragraphs. The acceptance of the Proposal will be by written notice of award, mailed to the office designated in the Proposal, or delivered to the Bidder's representative. In the event of failure of the lowest responsive, responsible Bidder to sign the Contract and provide an acceptable Performance Bond, Payment Bond, insurance certificate(s) and evidence of holding required licenses and certificates, the Owner may award the Contract to the next lowest responsive, responsible Bidder. Such award, if made, will be made within ninety (90) days after the opening of Proposals.

The awarded Contractor shall agree to hold the bid lump sum fees for each NTP for a minimum of three (3) years from the date of Notice of Award.

The CITY reserves the right to accept or reject any or all Proposals, and to waive any informalities and irregularities in said Proposals.

13. **BASIS OF AWARD**

The award will be made by the Owner on the basis of the Total BID (sum of NTP 1 + NTP 2 + NTP 3 + Owner Selected Bid Alternates) from the lowest, responsive, responsible BIDDER which, in the Owner's sole and absolute judgment will best serve the interest of the Owner. The Owner retains the option to award based on NTP 1 + NTP 2 + Owner Selected Bid Alternates.

14. **EXECUTION OF CONTRACT**

The successful Bidder shall, within ten (10) working days after receiving Notice of Award, sign and deliver to the CITY an original Contract and two (2) copies in the form hereto attached, together with the insurance certificate examples of the bonds as required in the Contract Documents and evidence of holding required licenses and certificates. Within 10 working days after receiving the signed Contract from the successful Bidder, the City's authorized agent will sign the Contract. Signature by both parties constitutes execution of the Contract.

The contract shall be executed on the basis on available funding and respective NTP lump sum fees, starting with NTP 1. NTP 2 will follow, with NTP 3 as the final Phase IA component as exercised by approved change order.

**INSTRUCTIONS TO BIDDERS (continued)**15. **CONTRACT BONDS**A. **PERFORMANCE AND PAYMENT BONDS**

The successful Bidder shall file with the CITY, at the time of delivery of the signed Contract, a Performance Bond and Payment Bond on the form bound herewith, each in the full amount of the Contract price in accordance with the requirements of Florida Statutes Section 255.05 or 713.23, as applicable, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the construction of the work, and to cover all guarantees against defective workmanship or materials, or both, during the warranty period following the date of final acceptance of the work by the CITY. The Surety furnishing this bond shall have a sound financial standing and a record of service satisfactory to the CITY, shall be authorized to do business in the State of Florida, and shall be listed on the current U.S. Department of Treasury Circular Number 570, or amendments thereto in the Federal Register, of acceptable Sureties for federal projects. The CONTRACTOR shall supply the OWNER with phone numbers, addresses, and contacts for the Surety and their agents. Pursuant to Section 255.05(7), Florida Statutes, in lieu of the bond required by law, the contractor may file with the city an alternative form of security in the form of cash, a money order, a certified check, a cashier's check or an irrevocable letter of credit.

B. **POWER-OF-ATTORNEY**

The Attorney-in-Fact (Resident Agent) who executes this Performance and Payment Bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond.

All Contracts, Performance and Payment Bonds, and respective powers-of-attorney will have the same date.

16. **FAILURE TO EXECUTE CONTRACT AND FURNISH BOND**

The Bidder who has a Contract awarded to him and who fails to promptly and properly execute the Contract or furnish the required Bonds shall forfeit the bid security that accompanied his bid, and the bid security shall be retained as liquidated damages by the CITY, and it is agreed that this said sum is a fair estimate of the amount of damages the CITY will sustain in case the Bidder fails to enter into a Contract or furnish the required Bonds. Bid security deposited in the form of cash, a certified check, or cashier's check shall be subject to the same requirement as a Bid Bond.

**INSTRUCTIONS TO BIDDERS (continued)**

17. **PERFORMANCE OF WORK BY CONTRACTOR**

Each Bidder must furnish with his Proposal a list of the items that he will perform with his own forces and the estimated total cost of these items.

18. **TIME OF COMPLETION**

The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions stated in the General Conditions.

When the Contractor receives a Notice to Proceed, he shall commence work as soon as possible and shall complete all work within the number of calendar days stipulated in this Proposal.

The term of this contract will not exceed **910 calendar** days as follows:

NTP 1:	365 days
NTP 2:	365 days
NTP 3:	<u>180 days</u>
	910 days

NTP completion days may overlap based on funding and date of respective Notice to Proceed. In the event the City elects not to authorize NTP 3, the contract term shall be reduced accordingly.

**PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

\* \* \* \* \*

**PROPOSAL**

NOTE TO BIDDER: Use preferably BLACK ink for completing this Proposal form.

To: The City of Key West  
Address: 3126 Flagler Street, Key West, Florida 33041  
Project Title: TRUMAN WATERFRONT PARK PHASE 1A

Bidder's contact person for additional information on this Proposal:

Company Name: \_\_\_\_\_

Contact Name & Telephone #: \_\_\_\_\_

Email Address: \_\_\_\_\_

**BIDDER'S DECLARATION AND UNDERSTANDING**

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein, that this Proposal is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Proposal is made without any connection or collusion with any person submitting another Proposal on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal.

**CONTRACT EXECUTION AND BONDS**

The Bidder agrees that if this Proposal is accepted, he will, within 10 days, not including Sundays and legal holidays, after Notice of Award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner examples of the Performance Bond and Payment Bond required herein, and evidence of holding required licenses and certificates, and will, to the extent of his Proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

**PROPOSAL (continued)**

**CERTIFICATES OF INSURANCE**

Bidder agrees to furnish the Owner, before commencing the work under this Contract, the certificates of insurance as specified in these Documents.

All contractors and subcontractors wishing to perform work for the City of Key West, Florida, will be required to comply with the following minimum insurance requirements:

Commercial General Liability Limits:	\$2,000,000 Aggregate \$1,000,000 Each Occurrence \$2,000,000 Products-Comp / Op Aggregate \$1,000,000 Personal Injury \$300,000 Fire Damage / Legal
--------------------------------------	--

Coverage must include the following:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>- Contractual Liability</li> <li>- CG2010 (1185) or Equivalent</li> <li>- No exclusion for XCU</li> <li>- Products / Completed Operations</li> <li>- Personal Injury</li> </ul> | <ul style="list-style-type: none"> <li>- Commercial Form</li> <li>- Broad Form Property Damage</li> <li>- Premises / Operations</li> <li>- Independent Contractors (if any part of the work is to be subcontracted out)</li> </ul> |
|--|--|

Automobile Liability:	\$1,000,000 Combined Single Limit (Include Hired & Non-Owned Liability)
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Additional Umbrella Liability:	\$5,000,000 Occurrence / Aggregate
--------------------------------	------------------------------------

Worker's Compensation:	Statutory
Employer's Liability:	\$1,000,000 Each Accident \$1,000,000 Disease-Policy Limit \$1,000,000 Disease-Each Employee

Pollution Liability:	\$2,000,000
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The Contractor will be required to provide Builders Risk insurance for the completed value of the project.

The above reflects the minimum requirements for working with the City of Key West. Any requirements found in a particular job's contract that are of a higher standard will prevail. The City of Key West must be named as an additional insured under all policies other than worker's compensation. Contractor's or subcontractor's general liability shall be written on a primary and non-contributory basis. Certificates of insurance must be accompanied by a copy of the additional insured endorsement (CG 20101185 or combination of CG20100704 and CG20370704 will be accepted). Contractors and subcontractors must obtain an endorsement from their carrier that waives and relinquishes any right of subrogation against the City of Key West and its agents, representatives, employees, and affiliates they might possess for any policy of insurance provided under this requirement or under any state or federal worker's compensation or employer's liability act. Contractor's policies must be endorsed to give no less than thirty (30) day notice to the City in the event of material change or cancellation. The City of Key West must be given a certificate of insurance showing that the above requirements have been met. The certificate of insurance must remain current and



**PROPOSAL (continued)**

**LUMP SUM ITEMS**

The Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on the following lump sum amounts. The Bidder agrees that the lump sum represent a true measure of the labor and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

**1. NTP 1 BASE BID**

1 LS \$ \_\_\_\_\_

Unforeseen Conditions Allowance

1 LS (10% of NTP 1 Base Bid) \$ \_\_\_\_\_

**TOTAL NTP 1** \$ \_\_\_\_\_

**2. NTP 2 BASE BID**

1 LS \$ \_\_\_\_\_

Restroom Building Allowance

1 LS \$ 250,000.00

Contingency Allowance

1 LS (10% of NTP 2 Base Bid) \$ \_\_\_\_\_

**TOTAL NTP 2** \$ \_\_\_\_\_

**3. NTP 3 BASE BID**

1 LS \$ \_\_\_\_\_

Contingency Allowance

1 LS (10% of NTP 3 Base Bid) \$ \_\_\_\_\_

**TOTAL NTP 3** \$ \_\_\_\_\_

**TOTAL LUMP SUM BASE BID (SUM OF NTP 1 + NTP 2 + NTP 3 TOTALS LISTED ABOVE):**

\$ \_\_\_\_\_

\_\_\_\_\_ Dollars & \_\_\_\_\_ Cents

(amount written in words)





**PROPOSAL (continued)**

**SUBCONTRACTORS**

The Bidder further proposes that the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the work in the event that the Bidder is awarded the Contract:

---

**Name**

---

Trade	Percent of Total Base Bid		
Street	City	State	Zip

---

**Name**

---

Trade	Percent of Total Base Bid		
Street	City	State	Zip

---

**Name**

---

Trade	Percent of Total Base Bid		
Street	City	State	Zip

---

**Name**

---

Trade	Percent of Total Base Bid		
Street	City	State	Zip

---

**Name**

---

Trade	Percent of Total Base Bid		
Street	City	State	Zip

**PROPOSAL (continued)**

**SURETY**

\_\_\_\_\_ whose address is

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
Street City State Zip

**BIDDER**

The name of the Bidder submitting this Proposal is

\_\_\_\_\_ doing business at

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
Street City State Zip

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Proposal, or of the partnership, or of all persons interested in this Proposal as principals are as follows:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**PROPOSAL (continued)**

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this \_\_\_\_\_ day of \_\_\_\_\_ 2015.

\_\_\_\_\_  
Signature of Bidder

\_\_\_\_\_  
Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this \_\_\_\_\_ day of \_\_\_\_\_ 2015.

(SEAL)

\_\_\_\_\_  
Name of Corporation

By \_\_\_\_\_

Title \_\_\_\_\_

Attest \_\_\_\_\_

**EXPERIENCE OF BIDDER**

The Bidder states that he is an experienced CONTRACTOR and has completed similar projects within the last 5 years. List similar projects, with types, names of OWNERS, construction costs, ENGINEERS, and references with phone numbers on attached sheet.

\*\*\*\*\*

**FLORIDA BID BOND**

BOND NO. \_\_\_\_\_

AMOUNT: \$ \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, that \_\_\_\_\_

\_\_\_\_\_ hereinafter called the PRINCIPAL, and \_\_\_\_\_

\_\_\_\_\_ a corporation duly organized under the laws of the State of \_\_\_\_\_

having its principal place of business at \_\_\_\_\_

\_\_\_\_\_ in the State of \_\_\_\_\_,

and authorized to do business in the State of Florida, as SURETY, are held and firmly bound unto

\_\_\_\_\_ hereinafter CITY OF KEY WEST called the OBLIGEE, in the sum of \_\_\_\_\_  
\_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_)

for the payment for which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these present.

THE CONDITION OF THIS BOND IS SUCH THAT:

WHEREAS, the PRINCIPAL is herewith submitting his or its Bid Proposal for TRUMAN WATERFRONT PARK PHASE 1A, said Bid Proposal, by reference thereto, being hereby made a part hereof.



**FLORIDA BID BOND (continued)**

I, the undersigned hereby duly sworn, depose and say that no portion of the sum herein bid will be paid to any employees of the City of Key West as a commission, kickback, reward or gift, directly or indirectly by me or any member of my firm or by an officer of the corporation.

By: \_\_\_\_\_

Sworn and subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, 2015.

NOTARY PUBLIC, State of \_\_\_\_\_ at Large

My Commission Expires:

\* \* \* \* \*



SWORN STATEMENT UNDER SECTION 287.133(3)(A)  
**FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES**

**THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.**

1. This sworn statement is submitted with Bid or Proposal for \_\_\_\_\_  
\_\_\_\_\_

2. This sworn statement is submitted by \_\_\_\_\_  
(name of entity submitting sworn statement)

whose business address is \_\_\_\_\_  
\_\_\_\_\_

and (if applicable) its Federal Employer Identification Number (FEIN) is \_\_\_\_\_  
\_\_\_\_\_

(If the entity has no FEIN, include the Social Security Number of the individual  
signing this sworn statement \_\_\_\_\_

3. My name is \_\_\_\_\_  
(please print name of individual signing)

and my relationship to the entity named above is \_\_\_\_\_

4. I understand that a “public entity crime” as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including but not limited to, any bid or contract for goods or services to be provided to any public or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, material misrepresentation.

5. I understand that “convicted” or “conviction” as defined in Paragraph 287.133(1)(b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication guilt, in any federal or state trial court of record relating to charges brought by indictment information after July 1, 1989, as a result of a jury verdict, nonjury trial, or entry of a plea of guilty or nolo contendere.

**PUBLIC ENTITY CRIMES (continued)**

6. I understand that an “affiliate” as defined in Paragraph 287.133(1)(a), Florida Statutes, means
- a. A predecessor or successor of a person convicted of a public entity crime; or
  - b. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term “affiliate” includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm’s length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.
7. I understand that a “person” as defined in Paragraph 287.133(1)(8), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with public entity. The term “person” includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.
8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies).

\_\_\_\_Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND (Please indicate which additional statement applies.)

\_\_\_\_There has been a proceeding concerning the conviction before a hearing of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)

\_\_\_\_The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of

Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order.)

**PUBLIC ENTITY CRIMES (continued)**

\_\_\_\_\_The person or affiliate has not been put on the convicted vendor list. (Please describe any action taken by or pending with the Department of General Services.)

\_\_\_\_\_  
(signature)

\_\_\_\_\_  
(date)

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

\_\_\_\_\_who, after first being sworn by me, affixed his/her  
(name of individual signing)

signature in the space provided above on this \_\_\_\_\_day of \_\_\_\_\_, 2015.

My commission expires:

\_\_\_\_\_  
NOTARY PUBLIC

\* \* \* \* \*

**INDEMNIFICATION**

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or \$1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

CONTRACTOR: \_\_\_\_\_

SEAL:

\_\_\_\_\_  
Address

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\* \* \* \* \*

**LOCAL VENDOR CERTIFICATION PURSUANT TO CKW ORDINANCE 09-22 SECTION 2-798**

The undersigned, as a duly authorized representative of the vendor listed herein, certifies to the best of his/her knowledge and belief, that the vendor meets the definition of a "Local Business." For purposes of this section, "local business" shall mean a business which:

- a. Principle address as registered with the FL Department of State located within 30 miles of the boundaries of the city, listed with the chief licensing official as having a business tax receipt with its principle address within 30 miles of the boundaries of the city for at least one year immediately prior to the issuance of the solicitation.
- b. Maintains a workforce of at least 50 percent of its employees from the city or within 30 miles of its boundaries.
- c. Having paid all current license taxes and any other fees due the city at least 24 hours prior to the publication of the call for bids or request for proposals.
  - Not a local vendor pursuant to Ordinance 09-22 Section 2-798
  - Qualifies as a local vendor pursuant to Ordinance 09-22 Section 2-798

If you qualify, please complete the following in support of the self-certification & submit copies of your County and City business licenses. Failure to provide the information requested will result in denial of certification as a local business.

Business Name \_\_\_\_\_ Phone: \_\_\_\_\_

Current Local Address: \_\_\_\_\_ Fax: \_\_\_\_\_  
(P.O Box numbers may not be used to establish status)

Length of time at this address: \_\_\_\_\_

\_\_\_\_\_  
Date: \_\_\_\_\_  
Signature of Authorized Representative

STATE OF \_\_\_\_\_ COUNTY OF \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2015.

By \_\_\_\_\_, of \_\_\_\_\_  
(Name of officer or agent, title of officer or agent) (Name of corporation acknowledging)

or has produced identification \_\_\_\_\_ as identification  
(Type of identification)

\_\_\_\_\_  
Signature of Notary

Return Completed form with  
Supporting documents to: City  
of Key West Purchasing

\_\_\_\_\_  
Print, Type or Stamp Name of Notary

\_\_\_\_\_  
Title or Rank

\* \* \* \* \*





## **BIDDER'S CHECKLIST**

(Note: The purpose of this checklist is to serve as a reminder of major items to be addressed in submitting a bid and is not intended to be all inclusive. It does not alleviate the Bidder from the responsibility of becoming familiar with all aspects of the Contract Documents and proper completion and submission of his bid.)

1. All Contract Documents thoroughly read and understood. [ ]
2. All blank spaces in Proposal filled in, using black ink. [ ]
3. Total and unit prices added correctly and attached Schedule of Values [ ]
4. Addenda acknowledged. [ ]
5. Subcontractors are named as indicated in the Proposal. [ ]
6. Experience record included. [ ]
7. Proposal signed by authorized officer. [ ]
8. Bid Bond completed and executed, including power-of-attorney dated the same date as Bid Bond. [ ]
9. Bidder familiar with federal, state, and local laws, ordinances, rules and regulations affecting performance of the work. [ ]
10. Bidder, if successful, able to obtain and/or demonstrate possession of required licenses and certificates within (10) ten calendar days after receiving a Notice of Award. [ ]
11. BID submitted intact with the volume entitled "Bidding Requirements" and "Contract Forms", 1 original and 1 flash drive as stated in the invitation to bid. [ ]
12. Bid Documents submitted in sealed envelope and addressed and labeled in conformance with the instructions in the Invitation to Bid. [ ]

\* \* \* \* \*

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**PART 2**

**CONTRACT FORMS**

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**CONTRACT**

This Contract, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_ 2015,

by and between the City of Key West, hereinafter called the "Owner", and \_\_\_\_\_

\_\_\_\_\_ hereinafter called the "Contractor";

**WITNESSETH:**

The Contractor, in consideration of the sum to be paid him by the Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery, and appurtenances for ITB No. 15-022 TRUMAN WATERFRONT PARK PHASE 1A, Key West, Florida to the extent of the Proposal made by the Contractor, dated the \_\_\_\_\_ day of 2015, all in full compliance with the Contract Documents referred to herein.

The CONTRACT DOCUMENTS, including the signed copy of the PROPOSAL, CONTRACT FORMS, PERFORMANCE & PAYMENT BONDS AND SCOPE OF WORK.

In consideration of the performance of the work as set forth in these Contract Documents, the Owner agrees to pay to the Contractor the amount bid in the Proposal as adjusted in accordance with the Contract Documents, or as otherwise herein provided, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to complete the work within 910 calendar days as follows:

NTP 1:	365 days
NTP 2:	365 days
NTP 3:	<u>180 days</u>
	910 days

NTP completion days may overlap based on funding and date of respective Notice to Proceed. In the event the City elects not to authorize NTP 3, the contract term shall be reduced accordingly.

The Contractor agrees to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said BID.

The Contractor agrees to remedy all defects appearing in the work or developing in the materials furnished and the workmanship performed under this Contract during the warranty period after the date of final acceptance of the work by the Owner, and further agrees to indemnify and save the Owner harmless from any costs encountered in remedying such defects.

It is agreed that the Contract, based upon the BID, shall be fully complete within the stated number of consecutive calendar days from the date the Notice to Proceed is issued.

In the event the Contractor fails to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages for each NTP shall be paid at a rate of \$1,000.00 per day. Sundays and legal holidays shall be included in determining days in default.

This contract will automatically expire upon completion of the project. Contractors warranty obligations remain in effect.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this

\_\_\_\_\_ day of \_\_\_\_\_, A.D., 2015.

CITY OF KEY WEST

By \_\_\_\_\_

Title \_\_\_\_\_

CONTRACTOR

By \_\_\_\_\_

Title \_\_\_\_\_

\* \* \* \*

**FLORIDA PERFORMANCE BOND**

BOND NO. \_\_\_\_\_

AMOUNT: \$ \_\_\_\_\_

**KNOW ALL MEN BY THESE PRESENTS**, that in accordance with Florida Statutes Section 255.05 \_\_\_\_\_

with offices at \_\_\_\_\_  
hereinafter called the CONTRACTOR (Principal), and

\_\_\_\_\_

with offices at \_\_\_\_\_  
a corporation duly organized and existing under and by virtue of the laws of the State of Florida, hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto the **CITY OF KEY WEST**, hereinafter called the CITY (Obligee), in the sum of:

\_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_),  
lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

**THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:**

**WHEREAS**, the CONTRACTOR has executed and entered into a certain Contract hereto attached, with the CITY, dated \_\_\_\_\_, 2015, to furnish at his own cost, charges, and expense all the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the Contract Documents as defined therein, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein;

**NOW THEREFORE**, the conditions of this obligation are such that if the above bounden CONTRACTOR:

1. Shall in all respects comply with the terms and conditions of said Contract and his obligation there under, including the Contract Documents (which include the scope of work and conditions as prepared by the CITY, invitation to bid, instructions to bidders, the CONTRACTOR'S bid as accepted by the above CITY, the bid and contract performance and payment bonds, and all addenda, if any, issued prior to the opening of bids), being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying PRINCIPAL with labor, materials, or supplies, used directly or indirectly by PRINCIPAL in the prosecution of the work provided for in the contract; and

3. Pays CITY all losses, costs, expenses, damages, attorney's fees, including appellate proceedings, injury or loss of whatever kind and however arising including, without limitation, delay damages to which said CITY may be subject by reason of any wrongdoing, misconduct, want of care or skill, negligence, failure of performance, breach, failure to petition within the prescribed time, or default, including patent infringements, on the part of said CONTRACTOR, his agents or employees, in the execution or performance of said Contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this obligation shall be void; otherwise, to remain in full force and effect for the term of said Contract.

**AND**, the said Surety for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract Documents, or to the work to be performed, or materials to be furnished there under shall affect said obligation of said Surety on this Bond, and the said Surety does hereby waive notice of any such changes, extension of time, alterations, or additions of the terms of the Contract Documents, or to the work.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

**IN WITNESS WHEREOF**, the above parties bonded together have executed this instrument

this \_\_\_\_\_ day of \_\_\_\_\_, 2015, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

**CONTRACTOR**

By: \_\_\_\_\_

(SEAL)

ATTEST

**SURETY**

By: \_\_\_\_\_

(SEAL)

ATTEST

**FLORIDA PAYMENT BOND**

BOND NO. \_\_\_\_\_

AMOUNT: \$ \_\_\_\_\_

**KNOW ALL MEN BY THESE PRESENTS**, that in accordance with Florida Statutes Section 255.05, \_\_\_\_\_

with offices at \_\_\_\_\_ hereinafter called the CONTRACTOR, (Principal), and

\_\_\_\_\_ with offices at \_\_\_\_\_

a corporation duly organized and existing under and by virtue of the laws of the State of \_\_\_\_\_

\_\_\_\_\_, hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto CITY OF KEY WEST, hereinafter called the City (Obligee), in the sum of:

\_\_\_\_\_ DOLLARS( \_\_\_\_\_), lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, and the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

**THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:**

**WHEREAS**, the CONTRACTOR has executed and entered into a certain Contract for

**ITB No. 15-022 TRUMAN WATERFRONT PARK PHASE 1A** attached hereto, with the CITY, dated

\_\_\_\_\_, 2015, to furnish at his own cost, charges, and expense the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the plans, drawings (if any), and specifications prepared by the CITY, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents specifically mentioned herein and relative hereto, is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein.

**NOW THEREFORE**, the conditions of this obligation are such that if the above bounden CONTRACTOR shall in all respects comply with the terms and conditions of said Contract and his obligation thereunder, including the Contract Documents ,which include Scope of work and conditions prepared by the CITY, invitation to bid, instructions to bidders, the

CONTRACTOR’S bid as accepted by the CITY, the bid and contract and payment bonds, and all addenda, if any, issued prior to the opening of bids), and further that if said CONTRACTOR shall promptly make payments to all persons supplying materials, equipment, and/or labor, used directly or indirectly by said CONTRACTOR or subcontractors in the prosecution of the work for said contract is accordance with Florida Statutes, Section 255.05 or Section 713.23, then this obligation shall be void; otherwise to remain in full force and effect for the term of said contract, including and all guarantee periods as specifically mentioned in said Contract Documents.

**AND**, the said SURETY for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract or to the work to be performed, or materials to be furnished thereunder, or in the Contract Documents and specifications accompanying the said contract shall affect said obligation of said SURETY on this Bond, and the said SURETY does hereby waive notice of any such changes, extension of time, alternations, or additions of the terms of the Contract, or to the work, to the Contract Documents, or to the specifications.

Claimant shall give written notice to the CONTRACTOR and the SURETY as required by Section 255.05 or Section 713.23, Florida Statutes. Any action instituted against the CONTRACTOR or SURETY under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2) or Section 713.23, Florida Statutes.

**IN WITNESS WHEREOF**, the above parties bounded together have executed this instrument

this \_\_\_\_\_ day of \_\_\_\_\_, 2015, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

**CONTRACTOR**

By: \_\_\_\_\_

(SEAL)

ATTEST

**SURETY**

By: \_\_\_\_\_

(SEAL)

ATTEST

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**PART 3**

**CONDITIONS OF THE CONTRACT**

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# **GENERAL CONDITIONS CONTENTS**

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1. AS APPROVED
2. AS SHOWN, AND AS INDICATED
3. BIDDER
4. CONTRACT DOCUMENTS
5. CONTRACTOR
6. CONTRACT COMPLETION
7. DAYS
8. DRAWINGS
9. ENGINEER
10. NOTICE
11. OR EQUAL
12. OWNER
13. PLANS
14. SPECIFICATIONS
15. NOTICE TO PROCEED
16. SUBSTANTIAL COMPLETION
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CONSTITUTES RELEASE

\*\*\*\*\*

## **DEFINITIONS**

Whenever in the Contract Documents the following terms are used, the intent and meaning shall be interpreted as follows:

### **1. AS APPROVED**

The words “as approved”, unless otherwise qualified, shall be understood to be followed by the words “by the ENGINEER for conformance with the Contract Document”.

### **2. AS SHOWN, AND AS INDICATED**

The words “as shown” and “as Indicated” shall be understood to be followed by the words “on the Drawings”.

### **3. BIDDER**

The person or persons, partnership, firm, or corporation submitting a Proposal for the work contemplated.

### **4. CONTRACT DOCUMENTS**

The “Contract Documents” consist of the Bidding Requirements, Contract Forms, Conditions of the Contract, Specifications, Drawings, all modifications thereof incorporated into the Documents before their execution, Change Orders, and all other requirements incorporated by specific reference thereto. These form the Contract.

### **5. CONTRACTOR**

The person or persons, partnership, firm, or corporation who enters into the Contract awarded him by the OWNER.

### **6. CONTRACT COMPLETION**

The “Contract Completion” is the date the OWNER accepts the entire work as being in compliance with the Contract Documents, or formally waives nonconforming work to extent of nonconformity, and issues the final payment in accordance with the requirements set forth in Article, “Final Payment” of these General Conditions.

### **7. DAYS**

Unless otherwise specifically stated, the term “days” will be understood to mean calendar days. Business day or working day means any day other than Saturday, Sunday, or legal holiday.

### **8. DRAWINGS**

The term “Drawings” refers to the official Drawings, Profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the ENGINEER, which shows the location, character, dimensions, and details of the work to be performed. Drawings may either be bound in the same book as the balance of the Contract Documents, or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

### **9. ENGINEER**

The person or organization identified as such in the Contract Documents. The Term “ENGINEER” means ENGINEER or his authorized representative.

### **10. NOTICE**

The term “notice” or the requirement to notify, as used in the Contract Documents or applicable state or federal statutes, shall signify a written communication delivered in person or by registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to him who gives the notice.

### **11. OR EQUAL**

The term “or equal” shall be understood to indicate that the “equal” Product is equivalent to or better than the Product named in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the Project design requirements will be made by the ENGINEER. Such equal Products shall not be purchased or installed by the CONTRACTOR without written authorization.

### **12. OWNER**

The person, organization, or public body identified as such in the Contract Documents.

### **13. PLANS (See Drawings)**

#### **14. SPECIFICATIONS**

The term “Specifications” refers to those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the work and certain administrative details applicable thereto. Where standard specifications, such as those of ASTM, AASHTO, etc., have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents. If referenced specifications conflict with specifications contained herein, the requirements contained herein shall prevail.

#### **15. NOTICE TO PROCEED**

A written notice given by the OWNER to the CONTRACTOR (with a copy to the ENGINEER) fixing the date on which the Contract time will commence to run and on which the CONTRACTOR shall start to perform his obligation under the Contract Documents. The Notice to Proceed will be given within 30 days following the execution of the Contract by the OWNER.

#### **16. SUBSTANTIAL COMPLETION**

“Substantial Completion” shall be that degree of completion of the Project or a defined portion of the Project, as evidenced by the ENGINEER’s written notice of Substantial Completion, sufficient to Provide the OWNER, at his discretion, the full-time use of the Project or defined portion of the Project for the purposes for which it was intended. “Substantial Completion” of an operating facility shall be that degree of completion that has Provided a minimum of 7 continuous days of successful, trouble-free, operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the ENGINEER. All equipment contained in the work, plus all other components necessary to enable the OWNER to operate the facility in a manner that was intended, shall be complete on the substantial completion date.

#### **17. WORK**

The word “work” within these Contract Documents shall include all material, labor, tools, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good Practice to Provide a complete and satisfactory system or structure. As used herein, “Provide” shall be understood to mean “furnish and install, complete in-place”.

#### **CONTRACT DOCUMENTS**

#### **18. INTENT OF CONTRACT DOCUMENTS**

The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. The intent of the Documents is to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any work, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning.

Reference to standard specifications, manuals, or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect on the first published date of the Invitation to Bid, except as may be otherwise specifically stated. However, no Provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ENGINEER, or any ENGINEER’s consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of Article LIMITATIONS ON ENGINEER’S RESPONSIBILITIES.

#### **19. DISCREPANCIES AND OMISSIONS**

Any discrepancies or omissions found in the Contract Documents shall be reported to the ENGINEER immediately. The ENGINEER will clarify discrepancies or omissions, in writing, within a reasonable time.

In resolving inconsistencies among two or more sections of the Contract Documents, Precedence shall be given in the following order:

- A. CONTRACT
- B. PROPOSAL
- C. SUPPLEMENTARY CONDITIONS
- D. INVITATION TO BID
- E. INSTRUCTIONS TO BIDDERS
- F. GENERAL CONDITIONS
- G. SPECIFICATIONS
- H. DRAWINGS

Addenda shall take Precedence over all sections referenced therein. Figure dimensions on Drawings shall take precedence over scale dimensions. Detailed Drawings shall take precedence over general Drawings.

## **20. CHANGES IN THE WORK**

The OWNER, without notice to the Sureties and without invalidating the Contract, may order changes in the work within the general scope of the Contract by altering, adding to, or deducting from the work, the Contract being adjusted accordingly. All such work shall be executed under the conditions of the original Contract, except as specifically adjusted at the time of ordering such change.

In giving instructions, the ENGINEER may order minor changes in the work not involving extra cost and not inconsistent with the purposes of the Project, but otherwise, except in an emergency endangering life and Property, additions or deductions from the work shall be performed only in pursuance of an approved Change Order from the OWNER, countersigned by the ENGINEER.

If the work is reduced by alterations, such action shall not constitute a claim for damages based on loss of anticipated Profits.

## **21. EXAMINATION AND VERIFICATION OF CONTRACT DOCUMENTS**

The CONTRACTOR shall thoroughly examine and become familiar with all of the various parts of these Contract Documents and determine the nature and location of the work, the general and local conditions, and all other matters, which can in any way affect the work under this Contract. Failure to make an examination necessary for this determination shall not release the CONTRACTOR from the obligations of this Contract. No verbal agreement or conversation with any officer, agent, or employee of the OWNER or with the ENGINEER either before or after the execution of this Contract shall affect or modify any of the terms or obligations herein contained.

## **22. DOCUMENTS TO BE KEPT ON THE JOBSITE**

The CONTRACTOR shall keep one copy of the Contract Documents on the job- site, in good order, available to the ENGINEER and to his representatives.

The CONTRACTOR shall maintain on a daily basis at the jobsite, and make available to the ENGINEER on request, one current record set of the Drawings which have been accurately marked to indicate all modifications in the completed work that differ from the design information shown on the Drawings. Upon Substantial completion of the work, the

CONTRACTOR shall give the ENGINEER one complete set of these marked up record Drawings.

## **23. ADDITIONAL CONTRACT DOCUMENTS**

Copies of Contract Documents or Drawings may be obtained on request from the ENGINEER and by paying the actual cost of reproducing the Contract Documents or Drawings.

## **24. OWNERSHIP OF CONTRACT DOCUMENTS**

All portions of the Contract Documents, and copies thereof furnished by the ENGINEER are instruments of service for this Project. They are not to be used on other work and are to be returned to the ENGINEER on request at the completion of the work. Any reuse of these materials without specific written verification or adaptation by the ENGINEER will be at the risk of the user and without liability or legal expense to the ENGINEER. Such user shall hold the ENGINEER harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adaptation shall entitle the ENGINEER to further compensation at rates to be agreed upon by the user and the ENGINEER.

## **THE ENGINEER**

## **25. AUTHORITY OF THE ENGINEER**

The ENGINEER will be the OWNER's representative during the construction period. His authority and responsibility will be limited to the Provisions set forth in these Contract Documents. The ENGINEER will have the Authority to reject work that does not conform to the Contract Documents. However, neither the ENGINEER's authority to act under this Provision, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any SUBCONTRACTOR, their respective Sureties, any of their agents or employees, or any other person performing any of the work.

**26. DUTIES AND RESPONSIBILITIES OF THE ENGINEER**

The ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the Progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He will not make comprehensive or continuous review or observation to check quality or quantity of the work, and he will not be responsible for construction means, methods, techniques, sequences, or Procedures, or for safety Precautions and Programs in connection with the work. Visits and observations made by the ENGINEER shall not relieve the CONTRACTOR of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

The ENGINEER will make recommendations to the OWNER, in writing, on all claims of the OWNER or the CONTRACTOR arising from interpretation or execution of the Contract Documents. Such recommendations will be of factual and/or technical nature, and will not include the legal interpretation of the Contract Documents. Any necessary legal interpretation of the Contract Document will be made by the OWNER. Such recommendation shall be necessary before the CONTRACTOR can receive additional money under the terms of the Contract. Changes in work ordered by the ENGINEER shall be made in compliance with Article CHANGES IN THE WORK.

One or more Project representatives may be assigned to observe the work. It is understood that such Project representatives shall have the authority to issue notice of nonconformance and make decisions within the limitations of the authority of the ENGINEER. The CONTRACTOR shall furnish all reasonable assistance required by the ENGINEER or Project representatives for Proper observation of the work. The above-mentioned Project representatives shall not relieve the CONTRACTOR of his obligations to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

**27. LIMITATIONS ON ENGINEER'S RESPONSIBILITIES**

ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences, or Procedures of construction, or the safety Precautions and Programs incident thereto, and ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the work in accordance with the Contract Documents.

ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any SUBCONTRACTOR, any supplier, or of any other person or organization performing or furnishing any of the work.

Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "Proper", or "satisfactory", or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of this Article.

**28. REJECTED WORK**

Any defective work or nonconforming materials or equipment that may be discovered at any time prior to expiration of the warranty period shall be removed and replaced by work which shall conform to the Provisions of the Contract Documents. Any material condemned or rejected shall be removed at once from the Project site.

Failure on the part of the ENGINEER to condemn or reject bad or inferior work or to note nonconforming materials or equipment on CONTRACTOR submittals shall not be construed to imply acceptance of such work. The OWNER shall reserve and retain all of its rights and remedies at law against the CONTRACTOR and its Surety for correction of any and all latent defects discovered after the guarantee period.

**29. LINES AND GRADES**

Lines and grades shall be established as provided in the supplementary conditions. All stakes, marks, and other reference information shall be carefully preserved by the CONTRACTOR, and in case of their careless or unnecessary destruction or removal by him or his employees, such stakes, marks, and other information shall be replaced at the CONTRACTOR's expense.

### **30. SUBMITTALS**

After checking and verifying all field measurements and after complying with applicable Procedures specified in Division I, GENERAL REQUIREMENTS, CONTRACTOR shall submit to ENGINEER, in accordance with the schedule for submittals for review, shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment), which shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submittal. All submittals shall be identified as ENGINEER may require. The data shown shall be complete with respect to quantities, dimensions specified, performance and design criteria, materials, and similar data to enable ENGINEER to review the information. CONTRACTOR shall also submit to ENGINEER for review, with such Promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended.

Before submission of each submittal, CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the work and the Contract Documents.

At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the submittal may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each shop drawing submitted to ENGINEER for review and approval of each variation.

ENGINEER will review submittals with reasonable Promptness, but ENGINEER's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or Procedures of construction (except where a specific means, method, technique, sequence, or Procedure of construction is indicated in or required by the Contract Documents) or to safety Precautions or Programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of shop drawings and submit as required new

samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on Previous submittals.

ENGINEER's review of submittals shall not relieve CONTRACTOR from the responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated therein or accompanying the shop drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the shop drawings or from responsibility for having complied with the Provisions herein.

Where a shop drawing or sample is required by the specifications, any related work performed Prior to ENGINEER's review and approval of the pertinent submission shall be at the sole expense and responsibility of the CONTRACTOR.

### **31. DETAIL DRAWINGS AND INSTRUCTIONS**

The ENGINEER will furnish, with reasonable Promptness, additional instructions by means of Drawings or otherwise, if, in the ENGINEER's opinion, such are required for the Proper execution of the work. All such Drawings and instructions will be consistent with the Contract Documents, true developments thereof, and reasonably inferable there from.

### **THE CONTRACTOR AND HIS EMPLOYEES**

#### **32. CONTRACTOR, AN INDEPENDENT AGENT**

The CONTRACTOR shall independently perform all work under this Contract and shall not be considered as an agent of the OWNER or of the ENGINEER, nor shall the CONTRACTOR's SUBCONTRACTORS or employees be subagents of the OWNER or of the ENGINEER.

#### **32. (a) ASSIGNMENT OF CONTRACT**

Assignment of any part or the whole of this Contract shall be subject to review and approval of the City Commission.

### **33. SUBCONTRACTING**

Unless modified in the Supplementary Conditions, within 10 days after the execution of the Contract, the CONTRACTOR shall submit to the ENGINEER the names of all SUBCONTRACTORS Proposed for the work, including the names of any SUBCONTRACTORS that were submitted with the Proposal. The CONTRACTOR shall not employ any SUBCONTRACTORS to which the OWNER may object to as lacking capability to properly perform work of the type and scope anticipated.

The CONTRACTOR is as fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the Contract Documents shall create any contractual relationship between any SUBCONTRACTOR and the OWNER or ENGINEER.

### **34. INSURANCE AND LIABILITY**

#### **A. GENERAL**

The CONTRACTOR shall provide (from insurance companies acceptable to the OWNER) the insurance coverage designated hereinafter and pay all costs before commencing work under this Contract. The CONTRACTOR shall furnish the OWNER with certificates of insurance specified herein showing the type, amount class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:

“The insurance covered by this certificate shall not be canceled or materially altered, except after 30 days’ written notice has been received by the OWNER.”

In case of the breach of any Provision of this Article, the OWNER, at his option, may take out and maintain, at the expense of the CONTRACTOR, such insurance as the OWNER may deem Proper and may deduct the cost of such insurance from any monies which may be due or become due the CONTRACTOR under this Contract.

#### **B. CONTRACTOR AND SUBCONTRACTOR INSURANCE**

The CONTRACTOR shall not commence work under this Contract until he has obtained all the insurance required hereunder and such insurance has been reviewed by the OWNER, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence work on his subcontract until insurance specified below has been obtained. Review of the insurance by the OWNER shall not relieve or decrease the

liability of the CONTRACTOR hereunder.

#### **C. COMPENSATION AND EMPLOYER’S LIABILITY INSURANCE**

The CONTRACTOR shall maintain during the life of this Contract the statutory amount of Workmen’s Compensation Insurance, in addition, Employer’s Liability Insurance in an amount as specified in the Supplementary Conditions, for each occurrence, for all of his employees to be engaged in work on the Project under this Contract. In case any such work is subcontracted, the CONTRACTOR shall require the SUBCONTRACTOR to provide similar Workmen’s Compensation and Employer’s Liability Insurance for all of the SUBCONTRACTOR’s employees to be engaged in such work.

#### **D. GENERAL LIABILITY INSURANCE (INCLUDING AUTOMOBILE)**

The CONTRACTOR shall maintain during the life of this Contract such general liability, completed operations and Products liability, and automobile liability insurance as will Provide coverage for claims for damages for personal injury, including accidental death, as well as for claims for Property damage, which may arise directly or indirectly from performance of the work under this Contract. The general liability policy shall include contractual liability assumed by the CONTRACTOR under Article **INDEMNITY**. Coverage for Property damage shall be on a “broad form” basis with no exclusions for “X, C & U”. The amount of insurance to be provided shall be as specified in the Supplementary Conditions.

In the event any work under this Contract is performed by a SUBCONTRACTOR, the CONTRACTOR shall be responsible for any liability directly or indirectly arising out of the work performed by the SUBCONTRACTOR; to the extent such liability is not covered by the SUBCONTRACTOR’s insurance.

The OWNER and ENGINEER, their officers, agents, and employees shall be named as Additional Insured’s on the CONTRACTOR’s and any SUBCONTRACTOR’s general liability and automobile liability insurance policies for any claims arising out of work performed under this Contract.

**E. BUILDERS RISK ALL RISK INSURANCE**

Unless otherwise modified in the Supplementary Conditions, the CONTRACTOR shall secure and maintain during the life of this Contract, Builders Risk All Risk Insurance coverage in an amount equal to the full value of the facilities under construction. Such insurance shall include coverage for earthquake, landslide, flood, collapse, loss due to the results of faulty workmanship or design, and all other normally covered risks, and shall provide for losses to be paid to the CONTRACTOR, OWNER, and ENGINEER as their interests may appear.

The OWNER and ENGINEER, their officers, agents, and employees shall be named as additional insured's on the CONTRACTOR's and any SUBCONTRACTOR's Builders Risk All Risk insurance policies for any claims arising out of work performed under this Contract.

This insurance shall include a waiver of subrogation as to the ENGINEER, the OWNER, the CONTRACTOR, and their respective officers, agents, employees and SUBCONTRACTORS.

**F. NO PERSONAL LIABILITY OF PUBLIC OFFICIALS**

In carrying out any of the Provisions hereof in exercising any authority granted by the Contract, there will be no personal liability upon any public official.

**35. INDEMNITY**

To the maximum extent permitted by law, the CONTRACTOR shall indemnify and defend the OWNER and the ENGINEER, and their officers, employees, agents, and sub-consultants, from all claims and losses, including attorney's fees and litigation costs arising out of Property losses or health, safety, personal injury, or death claims by the CONTRACTOR, its SUBCONTRACTORS of any tier, and their employees, agents, or invitees regardless of the fault, breach of Contract, or negligence of the OWNER or ENGINEER, excepting only such claims or losses that have been adjudicated to have been caused solely by the negligence of the OWNER or the ENGINEER and regardless of whether or not the CONTRACTOR is or can be named a party in a litigation.

**36. EXCLUSION OF CONTRACTOR CLAIMS**

In performing its obligations, the ENGINEER and its consultants may cause expense for the CONTRACTOR or its SUBCONTRACTORS and equipment or material suppliers. However, those parties and their sureties shall maintain no direct action against the ENGINEER, its officers, employees, agents, and consultants for any claim arising out of, in

connection with, or resulting from the engineering services performed or required to be performed.

**37. TAXES AND CHARGES**

The CONTRACTOR shall withhold and pay any and all sales and use taxes and all withholding taxes, whether State or Federal, and pay all Social Security charges and also all State Unemployment Compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

**38. REQUIREMENTS OF STATE LAW FOR PUBLIC WORKS PROJECTS**

When the Contract Documents concern public works of the state or any county, municipality, or political subdivision created by its laws, the applicable statutes shall apply. All parties to this Contract shall determine the contents of all applicable statutes and comply with their Provisions throughout the performance of the Contract.

**39. CODES, ORDINANCES, PERMITS AND LICENSES**

The CONTRACTOR shall keep himself fully informed of all local codes and ordinances, as well as state and federal laws, which in any manner affect the work herein specified. The CONTRACTOR shall at all times comply with said codes and ordinances, laws, and regulations, and Protect and indemnify the OWNER, the ENGINEER and their respective employees, and its officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses and inspection fees necessary for Prosecution and completion of the work shall be secured and paid for by the CONTRACTOR, unless otherwise specified.

#### **40. SUPERINTENDENCE**

The CONTRACTOR shall keep at the project site, competent supervisory personnel. The CONTRACTOR shall designate, in writing, before starting work, a Project superintendent who shall be an employee of the CONTRACTOR and shall have complete authority to represent and to act for the CONTRACTOR. ENGINEER shall be notified in writing prior to any change in superintendent assignment. The CONTRACTOR shall give efficient supervision to the work, using his best skill and attention. The CONTRACTOR shall be solely responsible for all construction means, methods, techniques, and Procedures, and for providing adequate safety Precautions and coordinating all portions of the work under the Contract. It is specifically understood and agreed that the ENGINEER, its employees and agents, shall not have control or charge of and shall not be responsible for the construction means, methods, techniques, Procedures, or for providing adequate safety Precautions in connection with the work under Contract.

#### **41. RECEPTION OF ENGINEER'S COMMUNICATIONS**

The superintendent shall receive for the CONTRACTOR all communications from the ENGINEER. Communications of major importance will be confirmed in writing upon request from the CONTRACTOR.

The ENGINEER may schedule Project meetings for the purposes of discussing and resolving matters concerning the various elements of the work. Time and place for these meetings and the names of persons required to be Present shall be as determined by the ENGINEER. CONTRACTOR shall comply with these attendance requirements and shall also require his SUBCONTRACTORS to comply.

#### **42. SAFETY**

The CONTRACTOR shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees) and Property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety Provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. The CONTRACTOR's failure to thoroughly familiarize himself with the aforementioned safety Provisions shall not relieve him from compliance with the obligations and penalties set forth therein.

The CONTRACTOR shall develop and maintain for the duration of this Contract, a safety Program that will effectively incorporate and implement all required safety Provisions. The CONTRACTOR shall appoint an employee who is qualified

and authorized to supervise and enforce compliance with the safety Program. The duty of the ENGINEER to conduct construction review of the work does not include review or approval of the adequacy of the CONTRACTOR's safety Program, safety supervisor, or any safety measures taken in, on, or near the construction site. The CONTRACTOR, as a part of his safety Program, shall maintain at his office or other well-known place at the jobsite, safety equipment applicable to the work as Prescribed by the aforementioned authorities, all articles necessary for giving first-aid to the injured, and shall establish the Procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the jobsite.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the ENGINEER and the OWNER. 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 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.

#### **43. PROTECTION OF WORK AND PROPERTY**

The CONTRACTOR shall at all times safely guard and Protect from damage the OWNER's Property, adjacent Property, and his own work from injury or loss in connection with this Contract. All facilities required for Protection by federal, state, or municipal laws and regulations and local conditions must be provided and maintained.

The CONTRACTOR shall Protect his work and materials from damage due to the nature of the work, the elements, carelessness of other CONTRACTORS, or from any cause whatever until the completion and acceptance of the work. All loss or damages arising out of the nature of the work to be done under these Contract Documents, or from any unforeseen obstruction or defects which may be encountered in the Prosecution of the work, or from the action of the elements, shall be sustained by the CONTRACTOR.

**44. RESPONSIBILITY OF CONTRACTOR TO ACT IN AN EMERGENCY**

In case of an emergency which threatens loss or injury of Property, and/or safety of life, the CONTRACTOR shall act, without previous instructions from the OWNER or ENGINEER, as the situation may warrant. The CONTRACTOR shall notify the ENGINEER thereof immediately thereafter. Any claim for compensation by the CONTRACTOR, together with substantiating documents in regard to expense, shall be submitted to the OWNER through the ENGINEER and the amount of compensation shall be determined by agreement.

**45. MATERIALS AND APPLIANCES**

Unless otherwise stipulated, the CONTRACTOR shall Provide and pay for all materials, labor, water, tools, equipment, heat, light, fuel, power, transportation, construction equipment and machinery, appliances, telephone, sanitary facilities, temporary facilities and other facilities and incidentals necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

In selecting and/or approving equipment for installation in the Project, the OWNER and ENGINEER assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable federal, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

**46. CONTRACTORS' AND MANUFACTURERS' COMPLIANCE WITH STATE SAFETY, OSHA, AND OTHER CODE REQUIREMENTS**

The completed work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items required by the state and federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the work subject to such safety regulations shall be fabricated, furnished, and installed (including OWNER-furnished equipment) in compliance with these requirements. CONTRACTORS and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. CONTRACTORS shall notify all equipment suppliers and SUBCONTRACTORS of the Provisions of this Article.

**47. SUBSTITUTION OF MATERIALS**

Except for OWNER-selected equipment items, and items where no substitution is clearly specified, whenever any material, article, device, Product, fixture, form, type of construction, or Process is indicated or specified by patent or Proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or Process desired. This Procedure

is not to be construed as eliminating from competition other Products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or equal". The CONTRACTOR may, in such cases, submit complete data to the ENGINEER for consideration of another material, type, or Process that shall be substantially equal in every respect to that so indicated or specified. Substitute materials shall not be used unless approved in writing. The ENGINEER will be the sole judge of the substituted article or material.

**48. TESTS, SAMPLES, AND OBSERVATIONS**

The CONTRACTOR shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the ENGINEER. When required, the CONTRACTOR shall furnish certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory.

The OWNER, ENGINEER, and authorized government agents, and their representatives shall at all times be Provided safe access to the work wherever it is in Preparation or Progress, and the CONTRACTOR shall Provide facilities for such access and for observations, including maintenance of temporary and permanent access.

If the Specifications, laws, ordinances, or any public authority require any work, to be specially tested or approved, the CONTRACTOR shall give timely notice of its readiness for observations. If any work should be covered up without approval or consent of the ENGINEER, it shall, if required by the ENGINEER, be uncovered for examination at the CONTRACTOR's expense.

Reexamination of questioned work may be ordered by the ENGINEER, and, if so ordered, the work shall be uncovered by the CONTRACTOR. If such work is found to be in accordance with the Contract Documents, the OWNER will pay the cost of uncovering, exposure, observation, inspection, testing and reconstruction. If such work is found to be not in accordance with the Contract Documents, the CONTRACTOR shall correct the defective work, and the cost of reexamination and correction of the defective work shall be paid by the CONTRACTOR.

**49. ROYALTIES AND PATENTS**

The CONTRACTOR shall pay all royalty and licenses fees, unless otherwise specified. The CONTRACTOR shall defend all suits or claims for infringement of any patent rights and shall save the OWNER and the ENGINEER harmless from any and all loss, including reasonable attorneys' fees, on account thereof.

**50. CONTRACTOR'S RIGHT TO TERMINATE CONTRACT**

If the work should be stopped under an order of any court or other public authority for a period of more than 3 months, through no act or fault of the CONTRACTOR, its SUBCONTRACTORS, or respective employees or if the ENGINEER should fail to make recommendation for payment to the OWNER or return payment request to CONTRACTOR for revision within 30 days after it is due, or if the OWNER should fail to pay the CONTRACTOR within 30 days after time specified in Article PARTIAL PAYMENTS, any sum recommended by the ENGINEER, then the CONTRACTOR may, upon 15 days' written notice to the OWNER and the ENGINEER, stop work or terminate this Contract and recover from the OWNER payment for all acceptable work performed and reasonable termination expenses, unless said default has been remedied.

**51. CORRECTION OF DEFECTIVE WORK DURING WARRANTY PERIOD**

The CONTRACTOR hereby agrees to make, at his own expense, all repairs or replacements necessitated by defects in materials or workmanship, Provided under terms of this Contract, and pay for any damage to other works resulting from such defects, which become evident within 2 years after the date of final acceptance of the work or within 2 years after the date of substantial completion established by the ENGINEER for specified items of equipment, or within such longer period as may be Prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. Un-remedied defects identified for correction during the warranty period but remaining after its expiration shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the work to an extended warranty period of 2 years after the defect has been remedied.

The CONTRACTOR further assumes responsibility for a similar guarantee for all work and materials provided by SUBCONTRACTORS or manufacturers of packaged equipment components. The effective date for the start of the guarantee or warranty period for equipment qualifying as substantially complete is defined in Article SUBSTANTIAL COMPLETION, AND Article SUBSTANTIAL

COMPLETION DATE, in these General Conditions.

The CONTRACTOR also agrees to hold the OWNER and the ENGINEER harmless from liability of any kind arising from damage due to said defects. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order for same from the OWNER. If the CONTRACTOR fails to make the repairs and replacements promptly, or in an emergency where delay would cause serious risk, or loss, or damage, the OWNER may have the defective work corrected or the rejected work removed and replaced, and the CONTRACTOR and his Surety shall be liable for the cost thereof.

**PROGRESS OF THE WORK**

**52. BEGINNING OF THE WORK**

Following execution of the Contract, the CONTRACTOR shall meet with the OWNER and ENGINEER relative to his arrangements for prosecuting the work.

**53. SCHEDULES AND PROGRESS REPORTS**

Prior to starting the construction, the CONTRACTOR shall Prepare and submit to the ENGINEER, a Progress schedule showing the dates on which each part or division of the work is expected to be started and finished, and a Preliminary schedule for submittals. The Progress schedule for submittals shall be brought up to date and submitted to the ENGINEER at the end of each month or at such other times the ENGINEER may request.

The CONTRACTOR shall forward to the ENGINEER, at the end of each month, an itemized report of the delivery status of major and critical items of purchased equipment and material, including shop drawings and the status of shop and field fabricated work. These Progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery, and cause of delay, if any.

If the completion of any part of the work or the delivery of materials is behind the submitted Progress schedule, the CONTRACTOR shall submit in writing a plan acceptable to the OWNER and ENGINEER for bringing the work up to schedule.

The OWNER shall have the right to withhold Progress payments for the work if the CONTRACTOR fails to update and submit the Progress schedule and reports as specified.

**54. PROSECUTION OF THE WORK**

It is expressly understood and agreed that the time of beginning, rate of Progress, and time of completion of the work are the essence of this Contract. The work shall be prosecuted at such time, and in or on such part or parts of the Project as may be required, to complete the Project as contemplated in the Contract Documents and the Progress schedule.

If the CONTRACTOR desires to carry on work at night or outside the regular hours, he shall give timely notice to the ENGINEER to allow satisfactory arrangements to be made for observing the work in Progress.

**55. OWNER'S RIGHT TO RETAIN IMPERFECT WORK**

If any part or portion of the work completed under this Contract shall Prove defective and not in accordance with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, the OWNER shall have the right and authority to retain such work but will make such deductions in the final payment therefore as may be just and reasonable.

**56. OWNER'S RIGHT TO DO WORK**

Should the CONTRACTOR neglect to Prosecute the work in conformance with the Contract Documents or neglect or refuse at his own cost to remove and replace work rejected by the ENGINEER, then the OWNER may notify the Surety of the condition, and after 10 days' written notice to the CONTRACTOR and the Surety, or without notice if an emergency or danger to the work or public exists, and without Prejudice to any other right which the OWNER may have under Contract, or otherwise, take over that portion of the work which has been improperly or non timely executed, and make good the deficiencies and deduct the cost thereof from the payments then or thereafter due the CONTRACTOR.

**57. OWNER'S RIGHT TO TRANSFER EMPLOYMENT**

If the CONTRACTOR should abandon the work or if he should persistently or repeatedly refuse or should fail to make prompt payment to SUBCONTRACTORS for material or labor, or to persistently disregard laws, ordinances, or to prosecute the work in conformance with the Contract Documents, or otherwise be guilty of a substantial violation of any Provision of the Contract or any laws or ordinance, then the OWNER may, without Prejudice to any other right or remedy, and after giving the CONTRACTOR and Surety 10

days' written notice, transfer the employment for said work from the CONTRACTOR to the Surety. Upon receipt of such notice, such Surety shall enter upon the Premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the work included under this contract and employ by Contract or otherwise, any qualified person or persons to finish the work and Provide the materials therefore, in accordance with the Contract Documents, without termination of the continuing full force and effect of this contract. In case of such transfer of employment to such Surety, the Surety shall be paid in its own name on estimates according to the terms hereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.

If, after the furnishing of said written notice to the Surety, the CONTRACTOR and the Surety still fail to make reasonable Progress on the performance of the work, the OWNER may terminate the employment of the CONTRACTOR and take possession of the Premises and of all materials, tools, and appliances thereon and finish the work by whatever method he may deem expedient and charge the cost thereof to the CONTRACTOR and the Surety. In such case, the CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the expense of completing the Contract, including compensation for additional managerial and administrative services, shall exceed such unpaid balance, the CONTRACTOR and the Surety shall pay the difference to the OWNER.

**58. DELAYS AND EXTENSION OF TIME**

If the CONTRACTOR is delayed in the Progress of the work by any act or neglect of the OWNER or the ENGINEER, or by any separate CONTRACTOR employed by the OWNER, or by strikes, lockouts, fire, adverse weather conditions not reasonably anticipated, or acts of Nature, and if the CONTRACTOR, within 48 hours of the start of the occurrence, gives written notice to the OWNER of the cause of the potential delay and estimate of the possible time extension involved, and within 10 days after the cause of the delay has been remedied, the CONTRACTOR gives written notice to the OWNER of any actual time extension requested as a result of the aforementioned occurrence, then the Contract time may be extended by change order for such reasonable time as the ENGINEER determines. It is agreed that no claim shall be made or allowed for any damages, loss, or expense which may arise out of any delay caused by the above referenced acts or occurrences other than claims for the appropriate extension of time. No extension of time will be granted to the CONTRACTOR for delays occurring to parts of the work that have no measurable impact on the completion of the total work under this Contract. No extension of time will be considered for weather conditions reasonably anticipated for the area in which the work is being performed. Reasonably anticipated weather conditions will be based on official

records of monthly Precipitation and other historical data. Adverse weather conditions, if determined to be of a severity that would impact Progress of the work, may be considered as cause for an extension of Contract completion time.

Delays in delivery of equipment or material purchased by the CONTRACTOR or his SUBCONTRACTORS, including OWNER-selected equipment shall not be considered as a just cause for delay, unless the OWNER determines that for good cause the delay is beyond the control of the CONTRACTOR. The CONTRACTOR shall be fully responsible for the timely ordering, scheduling, complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs, which may be accrued by the OWNER after the expiration of the time of completion. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the CONTRACTOR or Surety.

#### **59. DIFFERING SITE CONDITIONS**

The CONTRACTOR shall promptly, and before the conditions are disturbed, give a written notice to the OWNER and ENGINEER of:

- A. subsurface or latent physical conditions at the site which differ materially from those indicated in this contract,
- B. unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The ENGINEER will investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or the time required for, performing any part of the work under this Contract, whether or not changed as a result of the conditions, and equitable adjustment shall be made under this Article and the Contract modified in writing accordingly.

No request by the CONTRACTOR for an equitable adjustment to the Contract under this Article will be allowed, unless the CONTRACTOR has given the written notice required; Provided that the time prescribed above for giving written notice may be extended by the OWNER.

No request by the CONTRACTOR for an equitable adjustment to the Contract for differing site conditions will be

allowed if made after final payment under this Contract.

#### **60. LIQUIDATED DAMAGES**

Should the CONTRACTOR fail to complete the work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as Provided in the Contract, the CONTRACTOR shall reimburse the OWNER for the additional expense and damage for each calendar day, Sundays and legal holidays included, that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the OWNER after the expiration of the time of completion. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the CONTRACTOR or Surety.

#### **61. OTHER CONTRACTS**

The OWNER reserves the right to let other Contracts in connection with the work. The CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

If any part of the work under this Contract depends for Proper execution or results upon the work of any other CONTRACTOR, utility service company or OWNER, the CONTRACTOR shall inspect and Promptly report to the ENGINEER in writing any patent or apparent defects to deficiencies in such work that render it unsuitable for such Proper execution and results. The CONTRACTOR's failure to so report shall constitute and acceptance of the work by others as being fit and Proper for integration with work under this Contract, except for latent or non-apparent defects and deficiencies in the work.

**62. USE OF PREMISES**

The CONTRACTOR shall confine his equipment, the storage of materials and the operation of his workers to limits shown on the Drawings or indicated by law, ordinances, permits, or directions of the ENGINEER, and shall not unreasonably encumber the Premises with his materials. The CONTRACTOR shall provide, at his own expense, the necessary rights-of-way and access to the work, which may be required outside the limits of the OWNER's Property and shall furnish the ENGINEER copies of permits and agreements for use of the Property outside that provided by the OWNER.

The CONTRACTOR shall not load nor permit any part of the structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the work or adjacent Property to stresses or Pressures that will endanger it.

**63. SUBSTANTIAL COMPLETION DATE**

The ENGINEER may issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees, and to establish the date that the OWNER will assume the responsibility for the cost of operating such equipment. Said notice shall not be considered as final acceptance of any portion of the work or relieve the CONTRACTOR from completing the remaining work within the specified time and in full compliance with the Contract Documents. See SUBSTANTIAL COMPLETION under DEFINITIONS of these General Conditions.

**64. PERFORMANCE TESTING**

Operating equipment and systems shall be performance tested in the Presence of the ENGINEER to demonstrate compliance with the specified requirements. Performance testing shall be conducted under the specified design operating conditions or under such simulated operating conditions as recommended or approved by the ENGINEER. Schedule such testing with the ENGINEER at least one week in advance of the planned date for testing.

**65. OWNER'S USE OF PORTIONS OF THE WORK**

Following issuance of the written notice of Substantial Completion, the OWNER may initiate operation of the facility. Such use shall not be considered as final acceptance of any portion of the work, nor shall such use be considered as cause for an extension of the Contract completion time, unless authorized by a Change Order issued by the OWNER.

**66. CUTTING AND PATCHING**

The CONTRACTOR shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together Properly and fit it to receive or be received by work of other CONTRACTORS shown upon or reasonably implied by the Drawings.

**67. CLEANING UP**

The CONTRACTOR shall, at all times, keep Property on which work is in Progress and the adjacent Property free from accumulations of waste material or rubbish caused by employees or by the work. Upon completion of the construction, the CONTRACTOR shall remove all temporary structures, rubbish, and waste materials resulting from his operations.

**PAYMENT**

**68. PAYMENT FOR CHANGE ORDERS**

The OWNER's request for quotations on alterations to the work shall not be considered authorization to proceed with the work expediting, delivery, and installation of all equipment and materials. Within a reasonable period after the CONTRACTOR submits to the OWNER a written request for an extension of time, the ENGINEER will Present his written opinion to the OWNER as to whether an extension of time is justified, and, if so, his recommendation as to the number of days for time extension. The OWNER will make the final decision on all requests for extension of time.

Prior to the issuance of a formal Change Order, nor shall such request justify any delay in existing work. Quotations for alterations to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and profit. OWNER may require detailed cost data in order to substantiate the reasonableness of the proposed costs.

Any compensation paid in conjunction with the terms of a Change Order shall comprise total compensation due the CONTRACTOR for the work or alteration defined in the Change Order. By signing the Change Order, the CONTRACTOR acknowledges that the stipulated compensation includes payment for the work or alteration plus all payment for the interruption of schedules, extended overhead, delay, or any other impact claim or ripple effect, and by such signing specifically waives any reservation or claim for additional compensation in respect to the subject Change Order.

At the OWNER's option, payment or credit for any alterations covered by a Change Order shall be determined by one or a combination of the methods set forth in A, B, or C below, as applicable:

**A. UNIT PRICES**

Those unit Prices stipulated in the Proposal shall be utilized where they are applicable. In the event the Change Order results in a change in the original quantity that is materially and significantly different from the original bid quantity, a new unit Price shall be negotiated upon demand of either party. Unit Prices for new items included in the Change Order shall be negotiated and mutually agreed upon.

**B. LUMP SUM**

A total lump sum for the work negotiated and mutually acceptable to the CONTRACTOR and the OWNER. Lump sum quotations for modifications to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and Profit, all calculated as specified under "C" below.

**C. COST REIMBURSEMENT WORK**

The term "cost reimbursement" shall be understood to mean that payment for the work will be made on a time and expense basis, that is, on an accounting of the CONTRACTOR's forces, materials, equipment, and other items of cost as required and used to do the work.

If the method of payment cannot be agreed upon Prior to the beginning of the work, and the OWNER directs by written Change Order that the work be done on a cost reimbursement basis, then the CONTRACTOR shall furnish labor, and furnish and install equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual cost of the following:

1. Labor including foremen for those hours they are assigned and participating in the cost reimbursement work (actual payroll cost, including wages, fringe benefits as established by negotiated labor agreements, labor insurance, and labor taxes as established by law). No other fixed labor burdens will be considered, unless approved in writing by the OWNER.
2. Material delivered and used on the designated work, including sales tax, if paid by the CONTRACTOR or his SUBCONTRACTOR.
3. Rental or equivalent rental cost of equipment, including necessary transportation for items having a value in excess of \$100. Rental or equivalent

rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances shall not exceed the current rental rates prevailing in the locality. The rentals allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items, unless specific agreement to that effect is made.

4. Additional bond, as required and approved by the OWNER.
5. Additional insurance (other than labor insurance) as required and approved by the OWNER.

In addition to items 1 through 5 above, an added fixed fee for general overhead and Profit shall be negotiated and allowed for the CONTRACTOR (or approved SUBCONTRACTOR) actually executing the Cost Reimbursement work.

An additional fixed fee shall be negotiated and allowed the CONTRACTOR for the administrative handling of portions of the work that are executed by an approved SUBCONTRACTOR. No additional fixed fee will be allowed for the administrative handling of work executed by a SUBCONTRACTOR of a SUBCONTRACTOR, unless by written permission from the OWNER.

The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, Profit, and any other general expense. The CONTRACTOR's records shall make clear distinction between the direct costs of work paid for on a cost reimbursement basis and the costs of other work. The CONTRACTOR shall furnish the ENGINEER report sheets in duplicate of each day's cost reimbursement work no later than the working day following the performance of said work. The daily report sheets shall itemize the materials used, and shall cover the direct cost of labor and the charges for equipment rental, whether furnished by the CONTRACTOR, SUBCONTRACTOR or other forces. The daily report sheets shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated.

Material charges shall be substantiated by valid copies of vendors' invoices. Such invoices shall be submitted with the daily report sheets, or, if not available, they shall be submitted with subsequent daily report sheets. Said daily report sheets shall be signed by the CONTRACTOR or his authorized agent.

The OWNER reserves the right to furnish such materials and equipment as he deems expedient and the CONTRACTOR shall have no claim for profit or added fees on the cost of such materials and equipment. To receive partial payments and final payment for cost reimbursement work, the CONTRACTOR shall submit to the ENGINEER, detailed and complete documented verification of the CONTRACTOR's and any of his SUBCONTRACTORS' actual costs involved in the cost reimbursement work. Such costs shall be submitted within 30 days after said work has been performed.

## **69. PARTIAL PAYMENTS**

### **A. GENERAL**

Nothing in this Article shall be construed to affect the right, hereby reserved, to reject the whole or any part of the aforesaid work, should such work be later found not to comply with the Provisions of the Contract Documents. All estimated quantities of work for which partial payments have been made are subject to review and correction on the final estimate. Payment by the OWNER and acceptance by the CONTRACTOR of partial payments based on periodic estimates of quantities of work performed shall not, in any way, constitute acceptance of the estimated quantities used as a basis for computing the amounts of the partial payments.

### **B. ESTIMATE**

At least 30 days before each Progress payment falls due, as specified in the Supplementary Conditions, the CONTRACTOR shall submit to the ENGINEER a detailed estimate of the amount earned during the Preceding month for the separate portions of the work, and request payment. As used in this Article, the words "amount earned" means the value, on the date of the estimate for partial payment, of the work completed in accordance with the Contract Documents, and the value of approved materials delivered to the Project site suitable stored and Protected Prior to incorporation into the work.

ENGINEER will, within 7 days after receipt of each request for payment, either indicate in writing a recommendation of payment and present the request to OWNER, or return the request to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may, within 7 days, make the necessary corrections and resubmit the request.

ENGINEER may refuse to recommend the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such an extent as may be necessary in

ENGINEER's opinion to protect the OWNER from loss because:

1. The work is defective, or completed work has been damaged requiring correction or replacement;
2. Written claims have been made against OWNER or Liens have been filed in connection with the work;
3. The Contract Price has been reduced because of Change Orders;
4. OWNER has been required to correct defective work or complete the work in accordance with Article OWNER'S RIGHT TO DO WORK;
5. Of CONTRACTOR's unsatisfactory Prosecution of the work in accordance with the Contract Documents; or
6. CONTRACTOR's failure to make payment to SUBCONTRACTORS or for labor, materials, or equipment.

### **C. DEDUCTION FROM ESTIMATE**

Unless modified in the Supplementary Conditions, deductions from the estimate will be as described below:

1. The OWNER will deduct from the estimate, and retain as part security, 10 percent of the amount earned for work satisfactorily completed. A deduction and retainage of 10 percent will be made on the estimated amount earned for approved items of material delivered to and properly stored at the jobsite but not incorporated into the work. When the work is 50 percent complete, the OWNER may reduce the retainage to 5 percent of the dollar value of all work satisfactorily completed to date provided the CONTRACTOR is making satisfactory progress and there is no specific cause for a greater retainage. The OWNER may reinstate the retainage up to 10 percent if the OWNER determines, at his discretion, that the CONTRACTOR is not making satisfactory progress or where there is other specific cause for such withholding.

**D. QUALIFICATION FOR PARTIAL PAYMENT FOR MATERIALS DELIVERED**

Unless modified in the Supplementary Conditions, qualification for partial payment for materials delivered but not yet incorporated into the work shall be as described below:

1. Materials, as used herein, shall be considered to be those items which are fabricated and manufactured material and equipment. No consideration shall be given to individual purchases of less than \$200 for any one item.
2. To receive partial payment for materials delivered to the site, but not incorporated in the work, it shall be necessary for the CONTRACTOR to include a list of such materials on the Partial Payment Request. At his sole discretion, the ENGINEER may approve items for which partial payment is to be made. Partial payment shall be based on the CONTRACTOR's actual cost for the materials as evidenced by invoices from the supplier. Proper storage and Protection shall be provided by the CONTRACTOR, and as approved by the ENGINEER. Final payment shall be made only for materials actually incorporated in the work and, upon acceptance of the work, all materials remaining for which advance payments had been made shall revert to the CONTRACTOR, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the work.
3. CONTRACTOR warrants and guarantees that title to all work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER at the time of payment free and clear of all liens, claims, security interests, and encumbrances.
4. If requested by the ENGINEER, the CONTRACTOR shall provide, with subsequent pay requests, invoices receipted by the supplier showing payment in full has been made.

**E. PAYMENT**

After deducting the retainage and the amount of all previous partial payments made to the CONTRACTOR from the amount earned, the amount due will be made payable to the CONTRACTOR. Recommendations for payment received by the OWNER less than 9 days Prior to the scheduled day for payment will not be Processed or paid until the following month.

**70. CLAIMS FOR EXTRA WORK**

In any case where the CONTRACTOR deems additional time or compensation will become due him under this Contract for circumstances other than those defined in Article DELAYS AND EXTENSION OF TIME, the CONTRACTOR shall notify the ENGINEER, in writing, of his intention to make claim for such time or compensation before he begins the work on which he bases the claim, in order that such matters may be settled, if possible, or other appropriate action taken. The notice of claim shall be in duplicate, in writing, and shall state the circumstances and the reasons for the claim, but need not state the amount. If such notification is not given or if the ENGINEER is not afforded proper facilities by the CONTRACTOR for keeping strict account of actual cost, then the CONTRACTOR hereby agrees to waive the claim for such additional time or compensation. Such notice by the CONTRACTOR, and fact that the ENGINEER has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim.

No extension of time will be granted to the CONTRACTOR for delays resulting from extra work that have no measurable impact on the completion of the total work under this Contract. Claims for additional time or compensation shall be made in itemized detail and submitted, in writing, to the OWNER and ENGINEER within 10 days following completion of that portion of the work for which the CONTRACTOR bases his claim. Failure to make the claim for additional compensation in the manner and within the time specified above shall constitute waiver of that claim. In case the claim is found to be just, it shall be allowed and paid for as provided in Article PAYMENT FOR CHANGE ORDERS.

**71. RELEASE OF LIENS OR CLAIMS**

The CONTRACTOR shall indemnify and hold harmless the OWNER from all claims for labor and materials furnished under this Contract. Prior to the final payment, the CONTRACTOR shall furnish to the OWNER, as part of his final payment request, a certification that all of the CONTRACTOR's obligations on the project have been satisfied and that all monetary claims and indebtedness have been paid. The CONTRACTOR shall furnish complete and legal effective releases or waivers, satisfactory to the OWNER, of all liens arising out of or filed in connection with the work.

## **72. FINAL PAYMENT**

Upon completion of all the work under this Contract, the CONTRACTOR shall notify the ENGINEER, in writing, that he has completed his part of the Contract and shall request final payment. Upon receipt of such notice the ENGINEER will inspect and, if acceptable, submit to the OWNER his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the CONTRACTOR. Upon approval of this final estimate by the OWNER and compliance by the CONTRACTOR with Provisions in Article **RELEASE OF LIENS OR CLAIMS**, and other Provisions as may be applicable, the OWNER shall pay to the CONTRACTOR all monies due him under the Provisions of these Contract Documents.

## **73. NO WAIVER OF RIGHTS**

Neither the inspection by the OWNER, through the ENGINEER or any of his employees, nor any order by the OWNER for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the OWNER or ENGINEER, nor any extension of time, nor any possession taken by the OWNER or its employees, shall operate as a waiver of any Provision of this Contract, or any power herein reserved to the OWNER, or any right to damages herein Provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regards to latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the OWNER's rights under the warranty.

## **74. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE**

The acceptance by the CONTRACTOR of the final payment shall release the OWNER and the ENGINEER, as representatives of the OWNER, from all claims and all liability to the CONTRACTOR for all things done or furnished in connection with the work, and every act of the OWNER and others relating to or arising out of the work except claims Previously made in writing and still unsettled. No payment, however, final or otherwise, shall operate to release the CONTRACTOR or his Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds and warranties, as herein provided.

## SUPPLEMENTARY CONDITIONS

The General Conditions are hereby revised as follows:

### ARTICLE 9 “ENGINEER”

Delete Article “ENGINEER” in its entirety and substitute the following:

The person or organization identified as such in the Contract Documents. The Term “ENGINEER” means ENGINEER, ARCHITECT or his authorized representative.

### ARTICLE 34 "INSURANCE & LIABILITY”

Delete Article 34 “INSURANCE & LIABILITY” (A), (B), (C), and (D) in their entirety and substitute the following:

Contractor shall maintain limits no less than those stated below:

CONTRACTOR is to secure, pay for, and file with the City of Key West, prior to commencing any work under the Contract, all certificates for workers’ compensation, public liability, and property damage liability insurance, and such other insurance coverages as may be required by specifications and addenda thereto, in at least the following minimum amounts with specification amounts to prevail if greater than minimum amounts indicated. Notwithstanding any other provision of the Contract, the CONTRACTOR shall provide the minimum limits of liability insurance coverage as follows:

Auto Liability	\$1,000,000	Combined Single Limit
General Liability	\$2,000,000	Aggregate (Per Project)
	\$2,000,000	Products Aggregate
	\$1,000,000	Any One Occurrence
	\$1,000,000	Personal Injury
	\$ 300,000	Fire Damage/Legal
Additional Umbrella Liability	\$5,000,000	Occurrence / Aggregate
Pollution Liability	\$2,000,000	

CONTRACTOR shall furnish an original Certificate of Insurance indicating, and such policy providing coverage to, City of Key West named as an additional insured on a PRIMARY and NON CONTRIBUTORY basis utilizing an ISO standard endorsement at least as broad as CG 2010 (11/85) or its equivalent, (combination of CG 20 10 07 04 and CG 20 37 07 04, providing coverage for completed operations, is acceptable) including a waiver of subrogation clause in favor of City of Key West on all policies. CONTRACTOR will maintain the General Liability and Umbrella Liability insurance coverages summarized above with coverage continuing in full force including the additional insured endorsement until at least 3 years beyond completion and delivery of the work contracted herein.

Notwithstanding any other provision of the Contract, the CONTRACTOR shall maintain complete workers' compensation coverage for each and every employee, principal, officer, representative, or agent of the CONTRACTOR who is performing any labor, services, or material under the Contract. Further, CONTRACTOR shall additionally maintain the following minimum limits of coverage:

Bodily Injury Each Accident	\$1,000,000
Bodily Injury by Disease Each Employee	\$1,000,000
Bodily Injury by Disease Policy Limit	\$1,000,000

If the work is being done on or near a navigable waterway, CONTRACTOR's workers compensation policy shall be endorsed to provide USL&H Act (WC 00 01 06 A) and Jones Act (WC 00 02 01 A) coverage if specified by the City of Key West. CONTRACTOR shall provide the City of Key West with a Certificate of Insurance verifying compliance with the workman's compensation coverage as set forth herein and shall provide as often as required by the City of Key West such certification which shall also show the insurance company, policy number, effective and expiration date, and the limits of workman's compensation coverage under each policy.

CONTRACTOR's insurance policies shall be endorsed to give 30 days written notice to the City of Key West in the event of cancellation or material change, using form CG 02 24, or its equivalent.

Certificates of Insurance submitted to the City of Key West will not be accepted without copies of the endorsements being requested. This includes additional insured endorsements, cancellation/material change notice endorsements, and waivers of subrogation. Copies of USL&H Act and Jones Act endorsements will also be required if necessary. PLEASE ADVISE YOUR INSURANCE AGENT ACCORDINGLY.

CONTRACTOR will comply with any and all safety regulations required by any agency or regulatory body including but not limited to OSHA. CONTRACTOR will notify City of Key West immediately by telephone at (305) 809-3963 any accident or injury to anyone that occurs on the jobsite and is related to any of the work being performed by the CONTRACTOR.

Add the following Article:

#### G. SURETY AND INSURER QUALIFICATIONS

All bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or insurance company, having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida. If requested, Contractor shall Provide Proof of Florida Licensure for all insurance companies. The City of Key West shall be named as Additional Insured on the insurance certificates.

## ARTICLE 35 "INDEMNITY"

Delete Article 35 "INDEMNITY" in its entirety and substitute the following:

### INDEMNITY

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or \$1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

## ARTICLE 39 "CODES, ORDINANCES, PERMITS, AND LICENSES"

Add the following:

### A. PERMIT FOR WORK WITHIN LOCAL RIGHTS-OF-WAY

The Contractor shall obtain from the City of Key West the necessary permits for work within the rights-of-way. The Contractor shall abide by all regulations and conditions, including maintenance of traffic.

### B. NOISE ORDINANCE

City of Key West has a noise ordinance that allows working hours between 8:00 AM to 7:00 PM, Monday through Friday. No work should be performed during weekends or City Holidays, State Holidays and National Holidays. Construction operations outside these hours and these days will require approval of the Engineer and may require a variance from the City of Key West Commission.

D. "LICENSES"

**THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.**

1. Within 10 days of Notice of Award, the successful Bidder must represent that he holds all applicable, county, and City of Key West licenses and permits required to do business as a contractor with respect to the work described in the Contract Documents.
2. Further, the successful Bidder must, within 10 days of Notice of Award, furnish documentation showing that, as a minimum, he has complied with the provisions of Chapter 18 of the Code of Ordinances of the City of Key West in order to enter into the Agreement contained in the Contract Documents.
3. Specifically, within 10 days after Notice of Award, the successful Bidder must demonstrate that he holds, as a minimum, the following licenses and certificates:
  - a.) City of Key West Tax License Receipt;
  - b.) A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida
  - c.) A valid occupational license issued by the City of Key West, Florida.

E. WORK DURING HOLIDAYS

There shall be no work during City Holidays, State Holidays and National Holidays. Any construction operations during these days shall be approved by the City of Key West.

F. WORK DURING SPECIAL EVENTS

There shall be no work during Power Boat Race Week (typically early November) and Sailboat Race Week (typically January). Any construction operations during these days shall be approved by the City of Key West.

## ARTICLE 42 "SAFETY"

Add the following sub article:

### OCCUPATIONAL SAFETY AND HEALTH

The Contractor shall observe and comply with all applicable local, state, and federal occupational safety and health regulations during the prosecution of work under this Contract. In addition, full compliance by the Contractor with the U.S. Department of Labor's Occupational Safety and Health Standards, as established in Public Law 91-596, will be required under the terms of this Contract.

## ARTICLE 43 "PROTECTION OF WORK AND PROPERTY"

Add the following Article:

### HISTORIC PRESERVATION

The Contractor shall comply with Florida's Archives and Historic Act (Florida Statutes, Chapter 267) and the regulations of the local historic preservation board as applicable and protect against the potential loss or destruction of significant historical or archaeological data, sites, and properties in connection with the project.

## ARTICLE 57 "OWNERS RIGHT TO TRANSFER EMPLOYMENT"

Add the following Article:

### TERMINATION FOR CONVENIENCE AND RIGHT OF SUSPENSION

- A. Owner shall have the right to terminate this Contract without cause by written notice of Termination to the Contractor. In the event of such termination for convenience, the Contractor's recovery against the Owner shall be limited to that portion of the Contract amount earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred. Contractor shall not be entitled to any other or further recovery against the Owner, including, but not limited to, damages or any anticipated profit on portions of the Work not performed.
- B. The Owner shall have the right to suspend all or any portions of the Work upon giving the Contractor prior written notice of such suspension. If all or any portion of the Work is so suspended, the Contractor shall be entitled to reasonable costs, expenses and time extension associated with the suspension.

## ARTICLE 60 "LIQUIDATED DAMAGES"

Delete Article "LIQUIDATED DAMAGES" in its entirety and substitute the following:  
LIQUIDATED DAMAGES

Should the Contractor fail to complete the work or any part thereof in the time agreed upon in the Contract Documents or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day, Sundays and legal holidays included, that project outlined in Contract Documents remains uncompleted after the completion date. Liquidated damages shall be assessed. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per diem rate as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the Owner after the expiration of the time of completion. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty but as liquidated damages, which have accrued against the Contractor. The Owner shall have the right to deduct such damages from any amount due or that may become due the Contractor or the amount of such damages shall be due and collectible from the Contractor or Surety.

## ARTICLE 68 "PAYMENT FOR CHANGE ORDERS"

Add the following paragraph

If not initially included in the original construction agreement, Notice to Proceeds (NTPs) will be implemented via change order subject to approval by City Commission.

## ARTICLE 69 "PARTIAL PAYMENTS"

Delete the first paragraph of Article "PARTIAL PAYMENTS" and substitute the following:

No more than once each month the Contractor shall submit to the Engineer a detailed estimate of the amount earned during the preceding month for the separate portions of the work and request payment. As used in this Article the words "amount earned" means the value, on the date of the estimate, for partial payment of the work completed in accordance with the Contract Documents and the value of approved materials delivered to the project site suitably stored and protected prior to incorporation into the work.

Separate Application and Certification for Payment forms will be submitted for each Notice to Proceed.

ARTICLE 69 "PARTIAL PAYMENTS"

Add the following:

Payment will be made by the Owner to the Contractor within 40 days receipt of the written recommendation of payment from the Engineer.

ARTICLE 69 "PARTIAL PAYMENTS"

Delete Sub-article C "DEDUCTION FROM ESTIMATE" in its entirety and substitute the following:

DEDUCTION FROM ESTIMATE

The OWNER will deduct from the estimate, and retain as part security, 10 percent of the amount earned for work satisfactorily completed. A deduction and retainage of 10 percent will be made on the estimated amount earned for approved items of material delivered to and properly stored at the jobsite but not incorporated into the work. When the work for an individual Notice to Proceed is 90 percent complete, the OWNER may reduce the retainage to 5 percent of the dollar value of all work satisfactorily completed to date associated with that Notice to Proceed, provided the CONTRACTOR is making satisfactory progress and there is no specific cause for a greater retainage. The OWNER may reinstate the retainage up to 10 percent if the OWNER determines, at his discretion, that the CONTRACTOR is not making satisfactory progress or where there is other specific cause for such withholding. The remaining 5 percent will be held until final completion of the entire project.

Retainage will be held for each respective Notice to Proceed.

ARTICLE 69 "PARTIAL PAYMENTS"

Delete Subarticle E "PAYMENT" in its entirety and substitute the following:

PAYMENT

After deducting the retainage and the amount of all previous partial payments made to the Contractor from the amount earned the amount due will be made payable to the Contractor. Recommendations for payment received by the Owner less than 40 days prior to the scheduled day for payment will not be processed or paid until the following month.

The OWNER will withhold progress payments until the Contractor has satisfied the above conditions.

## ARTICLE 72 "FINAL PAYMENT"

Delete Article "FINAL PAYMENT" in its entirety and substitute the following:

### FINAL PAYMENT

Upon completion of the work the Contractor shall notify the Engineer, in writing, that he has completed it and shall request final payment. The Contractor shall be responsible for keeping an accurate and detailed record of his actual construction. Upon completion of construction and before final acceptance and payment the Contractor shall furnish the Engineer as-built drawings of his construction. Upon receipt of a request for final payment and the as-built drawings the Engineer will inspect and, if acceptable, submit to the Owner his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the Contractor. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Article RELEASE OF LIENS OR CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due him under the provisions of these Contract Documents.

## ARTICLE 72 "FINAL PAYMENT"

Add the following;

### **A. Acceptance and Final Payment.**

Whenever the Contractor has completely performed the work provided for under the Contract and the Engineer has performed a final inspection and made final acceptance and subject to the terms of the Engineer will prepare a final estimate showing the value of the work as soon as the Engineer makes the necessary measurements and computations. The Engineer will correct all prior estimates and payments in the final estimate and payment. The OWNER will pay the estimate, less any sums that the OWNER may have deducted or retained under the provisions of the Contract, as soon as practicable after final acceptance of the work, provided the Contractor has met the requirements of (1) through (8) below.

The Contractor has agreed in writing to accept the balance due or refund the overpayment, as determined by the OWNER, as full settlement of his account under the Contract and of all claims in connection therewith, or the Contractor, accepted the balance due or refunded the overpayment, as determined by the OWNER, with the stipulation that his acceptance of such payment or the making of such refund does not constitute any bar, admission, or estoppel, or have any effect as to those payments in dispute or the subject of a pending claim between the Contractor and the OWNER. To receive payment based on a FINAL PAYMENT CERTIFICATE, The Contractor further agrees, by submitting a FINAL PAYMENT CERTIFICATE that any pending or future arbitration claim or suit is limited to those particulars, including the itemized amounts, defined in the original FINAL PAYMENT CERTIFICATE , and that he will commence

with any such arbitration claim or suit within 15 calendar days from and after the time of final PAYMENT of the work and that his failure to file a formal claim within this period constitutes his full acceptance of the Engineer's final estimate and payment. The overpayment refund check from the Contractor, if required, will be considered a part of any Acceptance Letter executed.

- 1 The Contractor has properly maintained the project, as specified hereinbefore.
- 2 The Contractor has furnished a sworn affidavit to the effect that the Contractor has paid all bills and no suits are pending (other than those exceptions listed, if any) in connection with work performed under the Contract and that the Contractor has not offered or made any gift or gratuity to, or made any financial transaction of any nature with, any employee of the OWNER in the performance of the Contract.
- 3 The surety on the contract bond consents, by completion of their portion of the affidavit and surety release subsequent to the Contractor's completion of his portion, to final payment to the Contractor and agrees that the making of such payment does not relieve the surety of any of its obligations under the bond.
- 4 The Contractor has furnished all required mill tests and analysis reports to the Engineer.
- 5 The Contractor has furnished as-built drawings in AutoCad and Adobe PDF, in accordance with all supplied data collections and files to be compatible with Esri ArcGIS 10.2.2 Software. The current computing environment consists of:
  - Microsoft SQL Server
  - Windows 7/Server 2008
  - ESRI GIS Platform

#### Interfaces and Integrations

The City of Key West uses a number of software applications critical to its core operation and mission. The proposed mobile asset data collection solution will need to interface or integrate with these existing platforms.

- Arc Collector
- ArcGIS Online
- ArcMap 10.2

ADD ARTICLE 75 RESPONSIBILITY OF CONTRACTOR TO ACT IN AN EMERGENCY

- A. The city shall pay no additional compensation for hurricane and or any other acts of nature.
- B. **CLEANUP PROCEDURES FOR HURRICANE WARNINGS AND HURRICANE WATCH.** In the event the owner or National Oceanographic and Atmospheric Administration (NOAA) issues a Tropical Storm Watch or a Hurricane Watch for the Keys, the Engineer will contact the Contractor informing him that the Watch has been established. Within four (4) hours of the notice the Contractor shall provide 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 necessary supplies and barricades in the event a Tropical Storm Warning or a Hurricane Warning is issued. The Contractor shall remove all unnecessary items from work areas and shall tie down all movable objects (under 200 lbs.) The Engineer will determine "necessary" items. The Owner shall not be liable for any financial hardship or delays caused as a result of demobilization or remobilization of work due to the above.

ADD ARTICLE 76 CITY OF KEY WEST LICENSES, PERMITS AND FEES

- A. Pursuant to the Public Proposal Disclosure Act, there are a number of licenses, permits, and/or fees a Contractor **REQUIRED BY THE CITY OF KEY WEST** before or during construction by virtue of this construction as part of the Contract. Payment of these licenses, permits and/or fees is the responsibility of the Contractor unless specifically excluded. The Contractor shall verify each required license, permit, or fee before submitting the Proposal.

\* \* \* \* \*

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**PART 4**

**GROUNDWATER AND SOIL MANAGEMENT  
PLAN**

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# Revised Soil and Groundwater Management Plan (Revision 2) Truman Waterfront Park Key West, Florida

E Sciences Project Number 7-0070-002  
February 13, 2015

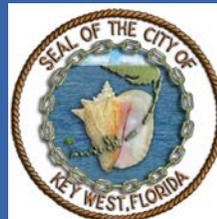


**ENGINEERING**  
**ENVIRONMENTAL**  
**ECOLOGICAL**

Prepared for:



Bermello Ajamil & Partners, Inc.  
2601 South Bayshore Drive 10th Floor  
Miami, Florida 33133



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



ENGINEERING  
ENVIRONMENTAL  
ECOLOGICAL

February 13, 2015

Mr. Randy P. Hollingworth  
Bermello, Ajamil & Partners, Inc.  
2601 South Bayshore Drive, 10<sup>th</sup> Floor  
Miami, FL 33133

**Subject: Revised Soil and Groundwater Management Plan – Revision 2  
Truman Waterfront Park  
Key West, Florida  
E Sciences Project Number 7-0070-002**

Dear Mr. Hollingworth:

E Sciences, Incorporated (E Sciences) is pleased to submit the enclosed Soil and Groundwater Management Plan (SMP/GMP) for the above referenced site. This SMP/GMP was developed to provide procedures and precautions to be implemented for the management of impacted soil and groundwater during construction activities associated with the development of a 23-acre park referred to as Truman Waterfront Park located on the westernmost area of Key West within the Truman Annex Naval Complex.

We appreciate the opportunity to perform these services for you and the City of Key West. Please contact us at (954) 484-8500 if you have questions regarding this information.

Sincerely,  
**E SCIENCES, INCORPORATED**

A handwritten signature in blue ink, appearing to read 'MPaituvi'.

Maria Paituvi, P.E.  
Senior Engineer

A handwritten signature in blue ink, appearing to read 'Nadia G. Locke'.

Nadia G. Locke, P.E.  
Associate

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- 1 Location Map
- 2 Aerial Photograph
- 3 Parcel Reference Map
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- B Site Rehabilitation Completion Order for Parcel E1 dated August 2001
- C Select Construction Plan Set Sheets for East Quay dated 1986
- D FDEP Chapter 62-713 F.A.C., Tables A & B
- E Truman Waterfront LUC Area Construction Permit

## 1.0 INTRODUCTION

The City of Key West Naval Properties Local Redevelopment Agency (LRA) has been engaged in the acquisition, planning and permitting of the redevelopment of a portion of the former US Navy Truman Waterfront base since 1995 as allowed by the Federal Government's Base Realignment and Closure (BRAC) process. The LRA is seeking to develop a portion of surplus Navy property known as the Truman Waterfront Upland Parcels, located in Key West, Monroe County, Florida. The overall project consists of designing and implementing a thematically integrated waterfront park consistent with the character of a surrounding historic community and is named the Truman Waterfront Park. E Sciences was engaged by Bermello, Ajamil & Partners, Inc. (B&A) to prepare a Soil and Groundwater Management Plan (SMP/GMP) for the Truman Waterfront Park Project (the Site).

The Site is located at the westernmost end of Key West within the Truman Annex Naval Complex. The Site encompasses multiple properties over an approximate 23-acre area adjacent to the Florida Bay waters. The Site includes Parcel C, Parcel K and Parcel E. The soil and groundwater on these parcels have historically been impacted by former Navy activities. The Navy has undertaken remedial activities in order to achieve cleanup to allow the construction of a recreational park and the unrestricted use of the park by the public. The presence of residual impacted soils will be capped to prevent exposure to the public. The soil and groundwater management provisions presented herein have been developed to provide management protocols specifically for construction activities that might require direct exposure, handling and disposal of residual subsurface impacted soil based during excavation. Additional information regarding the history and status of the assessment and remediation activities conducted at these properties is provided in Section 2.0. The Site location is depicted in **Figure 1**. **Figure 2** provides aerial coverage for the Site.

The provisions provided within this SMP/GMP are based on the review of the current information and reports available and cited herein. The provisions may be modified based on results of future assessment or testing conducted within the subject properties that may occur prior to or during the proposed development activities or based on historical assessment information that may be discovered or provided at later time. It is also noteworthy that the environmental conditions and restrictions are based on proposed deed modifications pending concurrence and approval from the Florida Department of Environmental Protection (FDEP).

## 2.0 BACKGROUND INFORMATION

The following sections provide a summary of impacts and the regulatory closure status for the following properties within the Site limits:

- City-owned portion of Parcel K: herein referred to as Parcel K.
- Parcel C: herein referred to as the Former Defense Reutilization and Marketing Office Waste Storage Area (DRMO) Parcel.
- Parcel E: subdivided into Parcel E1 (north portion) and Parcel E2 (south portion) and Parcel E3 (strip of land beneath the pavement directly adjacent to waterfront).

The above-referenced parcels have been, or are currently being, addressed for historical impacts under the Department of Navy, Naval Facilities Engineering Command (NAVFAC) BRAC Program. The impacts within these parcels have been addressed to the necessary standards to permit the construction of the proposed waterfront park and the recreational use by the public. The documented soil impacts has been addressed by means of excavation and offsite disposal or the installation of an engineering control that prevents direct exposure to the impacted soil, which will be preserved as part of the park development. The location of these parcels is depicted on **Figure 3**. The following sections present a cursory summary of the history of on those parcels, regulatory status and impacts.

Based on the extensive and complex environmental history of the Site, our understanding of the environmental conditions and restrictions for each parcel was provided to the FDEP and the Navy for concurrence. Correspondence regarding FDEP and Navy concurrence is provided in **Appendix A**.

For the purposes of this SMP/GMP, the soil layer extending from zero to two feet below land surface (bls) is referred to as surface soil and subsurface soil extends below two feet bls. An engineering control may consist of different configurations that prevent the exposure to impacted soil. Engineering controls include but are not limited to the following:

- A two-foot layer of non-impacted soil.
- A concrete or asphalt cover.
- Synthetic liners.

The following sections provide brief background information for each parcel.

### 2.1 Truman Annex DRMO Waste Storage Area (Parcel C)

The DRMO Parcel is approximately 6.25 acres of land located at the southeastern corner of the Site. The former use of this parcel included storage and use of fuels, oils and metals. The latest regulatory and assessment information for this parcel is documented in a *Site Rehabilitation Completion Report (SRCR)* dated December 2010 prepared by CH2M HILL. This parcel underwent numerous remediation activities

between 1998 and 2010. Excavation and disposal of impacted soil were implemented in order to meet the Soil Cleanup Target Levels (SCTL) defined under FDEP Chapter 62-777, Florida Administrative Code (F.A.C.) and achieve unrestricted land use criteria. Based on review of deed documentation provided by the City of Key West (the City), soil restrictions are in effect for this property and land use is currently restricted to non-residential.

Based on information provided in the 2010 SRCR, the soil impacts at the DRMO Parcel have been remediated to meet SCTLs and it is suitable for unrestricted land use. Therefore, the report recommended that the current Land Use Controls (LUC) tied to the property deed be revoked.

A *BRAC Five Year Review of Six BRAC Environmental Sites for Naval Air Station Key West* report dated April 2014 includes additional information regarding the DRMO Parcel. According to this document, parameters of concern included inorganics (lead, antimony, iron, arsenic, manganese), semi-volatile organic compounds (SVOC) (benzo[a]pyrene, benzo(b)fluoranthene, dibenzo[a,h]anthracene, and indeno(1,2,3-cd)pyrene) and polychlorinated biphenyls (PCBs).

Based on information disclosed during a teleconference held on April 14, 2014 (attended by BRAC, FDEP Federal Programs Section Bureau of Waste Cleanup and Naval Air Station Key West representatives), FDEP's review revealed a concern regarding historic iron levels in the soil and FDEP requested additional monitoring to determine that iron has not leached into the groundwater. The results of a recent groundwater sampling event revealed no groundwater contamination impacts. Other information disclosed during this teleconference indicates that FDEP is receptive to approval of the removal of the LUCs associated with the soil at this parcel. Therefore, this SMP is based on the assumption that no surface or subsurface soil impacts remain on the DRMO parcel. The GMP is based upon the absence of groundwater impacts. Overall, it is presumed that FDEP will issue a Site Rehabilitation Completion Order (SRCO) for the parcel and this will allow unrestricted groundwater and land use. A copy of the draft minutes from the April 14, 2014 teleconference provided to us is included in **Appendix A**.

We understand that the Navy will revise the deed for the DRMO Parcel and it will allow unrestricted land and groundwater use.

## **2.2 City-Owned Parcel K**

City-owned Parcel K is located on the Truman Annex waterfront. It historically housed multiple buildings associated with metal shops, repair shops, a lumber shed, boat and boiler shops and a foundry. The buildings were removed from this property in 1982. The storage and use of metals, solvents, fuels, acids and oil were considered potential sources of impacts at this location. The latest environmental report available for this parcel is the SRCR dated April 2014. Additional historical information on the current status for this parcel was also contained in the April 2014 BRAC 5 Year Review document. Based on review of deed documentation provided by the City, soil restrictions are in effect for this parcel and it is currently restricted to non-residential use. There are currently no groundwater use restrictions on this parcel.

Parameters of concern historically documented above FDEP SCTLs include PCBs, lead and polycyclic aromatic hydrocarbons (PAH) affecting the surface and subsurface soil. Source removal efforts were implemented between January 2012 and February 2012 in order to meet site-specific recreational use SCTLs at this parcel. The surface soil at this parcel currently meets site-specific Direct Exposure Recreational SCTLs, which allows the construction and use of the park.

The 2014 SRCR recommended that the deed restriction be revised to allow for recreational use of the parcel while maintaining the restriction on residential land use. In correspondence dated June 4, 2014, FDEP stated that the SRCR was suitable for its intent and approved as final. The FDEP would issue a SRCO upon demonstration that the deed has been revised according to the SRCR. Based on information disclosed during a teleconference held on April 14, 2014 (attended by BRAC, FDEP Federal Programs Section Bureau of Waste Cleanup and Naval Air Station Key West representatives), FDEP and BRAC are coordinating the completion of the SRCO and deed modifications.

The following table presents the SCTLs implemented for site rehabilitation. Please note that site-specific recreational SCTLs are above direct exposure residential SCTLs and therefore, those soils shall be considered impacted for the purposes of this SMP.

**TABLE 1-1**  
 Soil Cleanup Target Levels  
 Parcel K, NAS Key West

	<b>Lead (mg/kg)</b>	<b>PCBs (mg/kg)</b>	<b>PAHs (mg/kg)</b>
<b>Residential Adult and Child</b>	400	0.5 <sup>b</sup>	0.1 <sup>b</sup>
<b>Recreational Youth<sup>a</sup></b>	400	1.29 <sup>b</sup>	0.35 <sup>b</sup>
<b>Industrial Worker</b>	1,400	2.6 <sup>b</sup>	0.7 <sup>b</sup>
<b>Leachability<sup>c</sup></b>	400	17	8 <sup>d</sup>

All values are in milligrams per kilogram (mg/kg) units.  
<sup>a</sup> Exposure Factors were obtained from FDEP, RBCA Guidance, and recreational SCTL was calculated using assumptions provided in Appendix B.  
<sup>b</sup> When both PCBs and PAHs were collocated, cumulative risk from both PCBs and PAHs together was aimed to be 1E-6, which is equivalent to using the apportioned target SCTL value.  
<sup>c</sup> Selected LGW SCTL values are based on protection of groundwater to potable quality, although the area groundwater is likely in contact with saline water in the adjacent bay.  
<sup>d</sup> Individual PAHs have LGW SCTLs ranging from 0.7 mg/kg to 77 mg/kg (see Appendix A, Table A-4).

Source: Site Rehabilitation Completion Report, Soil Removal Actions at the City-Owned Portion of Parcel K Revision No. 02 dated April 2014 and prepared by CH2M HILL.

We understand that the Navy will revise the deed for Parcel K and it will allow unrestricted recreational land use and groundwater use.

### 2.3 Parcel E

Based on review of deed documentation provided by the City, the current LUCs enforced on Parcel E include non-residential land use provisions and groundwater use restrictions. The requirement for engineering controls exists but is limited to a delineated area on the former location of Building 136.

Based on assessment information and the current environmental status of distinct areas within Parcel E, this SMP addresses the following sub-parcel areas independently:

- Parcel E1: also referred to as the former Building 189 site.
- Parcel E2: formerly occupied by Building 136, Building 102 and Building 104 and currently occupied by Building 103
- Parcel E3: also referred to as East Quay.

It is our understanding that the FDEP understands that the above sub-parcels present individual environmental conditions independent of the current LUC provisions. Please refer to **Figure 3** for the location of each sub-parcel. The following sections include background information and environmental conditions pertinent to each sub-parcel.

### **2.3.1 Parcel E1**

Parcel E1 was formerly occupied by Building 189. The latest regulatory documentation available for review is the Site Rehabilitation Completion Order (SRCO) issued by FDEP for this parcel on August 7, 2001. A copy of the SRCO is included in **Appendix B**. Therefore, no groundwater or soil impacts associated with this sub-parcel of Parcel E are considered a concern for the proposed site development and land use as a park. The SMP is based upon the assumption that the Navy will revise the deed and land use restrictions will be removed for this parcel.

### **2.3.2 Parcel E2**

Parcel E2 was formerly occupied by Building 136, Building 102 and Building 104. Building 103 remains on the property. The approximate location of these buildings is depicted on **Figure 3**. Based on the environmental impacts in different areas within Parcel E2, we have provided discussions for two functional areas: the area including Building 102, 103 and 104 and the area including Building 136.

#### **Buildings 102, 103 and 104**

Buildings 102 (Former Torpedo Overhaul and Storehouse) and 104 (Former Battery Overhaul and Storage) have been removed. Knowledge of the operations in these buildings is limited to naval submarine support activities. Hazardous materials, specifically volatile organic compounds (VOCs), SVOCs, and inorganics are likely to have been used in these buildings. The latest environmental document available for this parcel regarding soil impacts is a *Proposed Plan for Soil Remedy* dated September 19, 1999. Previous remedial action efforts at Buildings 102 and 104 included the excavation of two separate areas of impacted soil to a depth of two feet bls. Based on review of the reports cited herein, SVOCs (specifically Benzo (a) pyrene constituents) remain above FDEP SCTLs in the subsurface soil.

Building 103 (Former Central Power Plant) is still standing but is out of service. Knowledge of the operations in this building is limited to naval submarine support activities. Documented parameters of concern include SVOCs and PCBs. Removal of impacted soil in the vicinity of Building 103 conducted prior to 1999 was impeded by building foundations and concrete transformer casements in the ground. Therefore, it is concluded that subsurface soil impacts remain within this area.

Most recent information regarding remedial efforts associated with the presence of petroleum free product in the groundwater near Building 102 and Building 103 was provided in a report titled *Annual Status Report Petroleum Recovery Program* December 2005 to December 2006 and *Monthly Status Report January 2007 for Trumbo Point Fuel Farm and Truman Annex Buildings 102 and 103* prepared by CH2M HILL. The presence of free product in the groundwater within the area of Building 102 and Building 103 was addressed by implementation of active and passive free product recovery. However, groundwater

analytical data was not available for review to evaluate the potential presence of residual groundwater petroleum impacts in this area.

Based on information provided above, the surface soil within this area of Parcel E2 has been remediated to meet Direct Exposure Residential SCTLs and therefore meets recreational use criteria. Impacts remain above FDEP SCTLs in the subsurface soil. Therefore, an engineering control shall be implemented on this area of Parcel E and subsurface soil shall be considered as impacted soil during construction activities.

Groundwater impacts are presumed within this area of Parcel E2, therefore groundwater use restrictions and groundwater management provisions are applicable for this area.

### Building 136

Building 136 served as a naval docking and support facility for more than a century. Building 136 (Shipfitters and, prior to 1951, the Plate and Mold Shop) was demolished and the debris was buried in and around the building's footprint in the 1980s, but the debris was later removed for off-site disposal. Lead, metals, solvents, and oils from building operations and demolition debris buried on site were considered potential soil parameters of concern. The latest regulatory environmental document available for this area is provided in a *Proposed Plan for Soil Remedy* dated September 19, 1999. Additional historical information was also identified in the April 2014 BRAC 5 Year Review document and the 2010 SRCR for the DRMO parcel.

Remedial efforts consisting of soil removal were implemented in this area in 1999 and 2007. COCs for this area included SVOCs, arsenic and iron. During the 1999 source removal, due to impacts remaining below the surface in the vicinity of building 136, an engineering control was implemented in order to address the residual arsenic soil impacts below two feet bls. This engineering control was incorporated into the deed restriction for Parcel E and was limited to a delineated area. Additional remedial efforts conducted in 2007, after the deed restriction was executed, removed the additional arsenic impacted soil near Building 136 to a depth of two feet bls.

No reports documenting the presence of groundwater impacts were identified or provided during the development of this document. Therefore, groundwater analytical data was not available for review to evaluate the potential presence of groundwater petroleum impacts in this area.

Based on information reviewed, no surface soil impacts are present within this area. However, we could not ascertain the presence or absence of subsurface soil impacts within this area of Parcel E2. Therefore, the subsurface soil will be considered impacted for the purposes of this SMP and an engineering control shall be implemented on this area of Parcel E. Groundwater use restrictions are in effect on this parcel

based on the current deed conditions. Groundwater restriction and management provisions will be applicable to this area of Parcel E2.

We understand that the deed will continue to have soil and groundwater land use restrictions for Parcel E2.

### **2.3.3 Parcel E3**

Parcel E3 consists of fill soil beneath the concrete slab of the “East Quay”. According to information provided by BRAC, in 1988 earthwork was conducted in this parcel to tie the seawall into the deadmen that anchor the wall. During these construction efforts, a Navy fuel line was identified in the work area. Several thousand cubic yards of petroleum-impacted soil were removed off-site as part of this construction activity. However, no documentation related to these activities has been located for review at this time. Construction plans and cross sections for this parcel dated 1986 depict the presence of diesel oil lines, tanks, an oil-water separator and other utilities. Boring logs included within the plan sheets, document the presence of petroleum product odors identified “above limestone” in the subsurface. Copies of select pages of the plan set identifying these features are provided in **Appendix C**.

Based on this limited information available and based on recommendations by BRAC, this parcel is considered to have surface and subsurface soil impacts. Groundwater use restrictions are in effect on this parcel based on the current deed conditions.

We understand that the deed will continue to have soil and groundwater land use restrictions for Parcel E3. The requirements and measures contained within this SMP/GMP regarding Parcel E3 are subject to change based on additional assessment or review of additional documentation that may be conducted at a later time.

The following table summarizes the current impacts and proposed restrictions for each parcel. The proposed restrictions are based on most recent groundwater assessment results conducted by the Navy and are subject to approval by FDEP.

**Table 2.1 Summary of Existing Environmental Conditions**

		Former DRMO	Parcel K	Parcel E1	Parcel E2	Parcel E3
<b>Surface Soil</b>	Above FDEP SCTLs		✓			✓
	Meets FDEP Residential Exposure SCTLs	✓		✓	✓	
	Meet Site-Specific Recreational SCTLs <sup>1</sup>		✓			
<b>Subsurface Soil</b>	Above FDEP SCTLs		✓		✓	✓
	Meets FDEP Residential Exposure SCTLs	✓		✓		
	Meets Site Specific Recreational SCTLs		✓			
<b>Groundwater</b>	Impacts Present or Presumed				✓	✓
	No Impacts	✓	✓	✓		
<b>Restrictions</b>	Engineering Control to prevent exposure to subsurface soil to be maintained				✓	✓
	Surface Soil to be replaced with clean fill or an engineering control to be installed over existing surface soil					✓
	Recreational Use Allowed for Surface Soil	✓	✓	✓	✓	
	Groundwater Use Restriction				✓	✓

SCTL =Soil Cleanup Target Levels defined under Florida Department of Environmental Protection (FDEP) Chapter 62-777, Florida Administrative Code (F.A.C.)

<sup>1</sup>Site-specific Recreational SCTL values area above the FDEP Direct Exposure Residential SCTLs (dependent on the parameter). Therefore, for the purposes of this SMP, Recreational soils are considered to be above FDEP SCTLs based on Direct Exposure Residential criteria.

### 3.0 SOIL MANAGEMENT PLAN

The following SMP has been developed to isolate the areas within the parcels where previous assessment activities identified soils with impacts above the Residential, Recreational and Industrial Direct Exposure SCTLs and to provide protocols and precautions that will be implemented for the management of soil excavated within the SMP area during design and construction activities for the Site. The proposed development plan is depicted on **Figure 4**.

The documented impacts within the subject parcels have been or will be addressed as follows in order to meet the regulatory requirements to construct the proposed park for the safe use of the public:

- Excavation and offsite disposal;
- Implementation of engineering controls to prevent direct exposure to subsurface impacted soil. This approach is widely implemented in similar conditions as it provides an effective barrier for the protection of the human health and the environment.

Soil impact information provided herein is based on information provided and contained within the documents referenced in Section 2.0. Table 3.1 below summarizes the soil impacts documented for each individual parcel. The areas and soil layers affected by impacts depicted on **Figure 5** are referred to as SMP areas as described herein.

Soil excavation and regulatory documentation within soil impact areas shall be conducted in accordance with FDEP Chapter 62-780.500(5) as it pertains to soil removal, treatment, and disposal.

**Table 3.1  
 Soil Impacts and SMP Summary**

<b>Site</b>	<b>Depth Interval</b>	<b>Impacts</b>	<b>SMP Provisions</b>
<b>DRMO</b>	No Impacts	<ul style="list-style-type: none"> <li>• No Impacts</li> </ul>	<ul style="list-style-type: none"> <li>•No import of soil from other parcels.</li> <li>•No re-use of soil beyond parcel boundaries.</li> </ul>
<b>Parcel K</b>	Surface Soil	<ul style="list-style-type: none"> <li>• Meets site-specific Recreational SCTLs</li> <li>•Above FDEP Residential SCTLs</li> </ul>	<ul style="list-style-type: none"> <li>•No re-use of soil beyond parcel boundaries.</li> <li>•Subject to SMP provisions.</li> </ul>
	Subsurface Soil	<ul style="list-style-type: none"> <li>• Meets site-specific Recreational SCTLs</li> <li>•Above Residential FDEP SCTLs</li> </ul>	<ul style="list-style-type: none"> <li>•No re-use of subsurface soil beyond parcel boundaries.</li> <li>•Subject to SMP provisions described in Section 3.0.</li> </ul>
<b>Parcel E1</b>	No Impacts	<ul style="list-style-type: none"> <li>•No Impacts</li> </ul>	<ul style="list-style-type: none"> <li>•No import of soil from other parcels.</li> <li>•No re-use of soil beyond parcel boundaries.</li> </ul>
<b>Parcel E2</b>	Surface Soil	<ul style="list-style-type: none"> <li>•No Impacts</li> </ul>	<ul style="list-style-type: none"> <li>•No import of soil from other parcels.</li> <li>•No re-use of soil beyond parcel boundaries.</li> </ul>
	Subsurface Soil	<ul style="list-style-type: none"> <li>•Above FDEP Residential SCTLs</li> </ul>	<ul style="list-style-type: none"> <li>•Subsurface soil excavated shall not be used above 2 feet bls within the parcel boundaries unless covered with an engineering control.</li> <li>•No re-use of soil beyond parcel boundaries.</li> <li>•If excavated, upper two feet must be replaced with a minimum of two feet of non-impacted soil or alternative engineering control.</li> <li>• Subject to SMP provisions described in Section 3.0.</li> </ul>
<b>Parcel E3</b>	Surface Soil (Beneath concrete)	<ul style="list-style-type: none"> <li>•Above FDEP Residential SCTLs</li> </ul>	<ul style="list-style-type: none"> <li>•Soil must be excavated or covered with appropriate engineering controls.</li> <li>•No re-use of soil beyond parcel boundaries.</li> <li>• Subject to SMP provisions described in Section 3.0.</li> </ul>
	Subsurface Soil	<ul style="list-style-type: none"> <li>•Above FDEP Residential SCTLs</li> </ul>	<ul style="list-style-type: none"> <li>•Soil must be covered with appropriate engineering controls.</li> <li>•No re-use of subsurface soil beyond parcel boundaries.</li> <li>• Subject to SMP provisions described in Section 3.0.</li> </ul>

Remediation efforts in Parcel K were targeted to meet site specific Recreational SCTLs. The Recreational SCTLs are equal or above Residential Direct Exposure SCTLs and therefore, soil excavated from those areas is to be handled as impacted soil.

In the event that soil staining/discoloration or odor is identified during construction, work in the affected area shall cease and onsite personnel shall notify the project manager in order to document the findings and evaluate the potential soil management provisions and proper course of action. In the event that buried debris is encountered during construction activities, work in the affected area shall cease and the project manager must be notified to document the findings and evaluate the proper course of action. Additional information regarding notifications is provided in Section 5.0.

### **3.1 Health and Safety Plan**

The proposed development will be conducted in areas subject to soil and groundwater restrictions due to the presence of parameters of concern. As such, the construction activities in those areas must be implemented by personnel who meet the necessary safety training requirements. These requirements include, but are not limited to training for workers who will come in direct contact with contaminated media as outlined in the Occupational Safety and Health Administration (OSHA) Standard 1910.120(e). While general requirements from this standard are outlined below the contractor shall ensure full compliance with OSHA requirements:

- General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.
- Workers on site only occasionally for a specific limited task (such as, but not limited to, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.
- On-site management and supervisors who supervise employees engaged in, hazardous waste operations shall receive 40 hours initial training, and three days of supervised field experience and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

Prior to implementing construction activities at the Site, the contractor shall develop a site-specific Health and Safety Plan (HASP) for workers directly exposed to soil and groundwater at the Site. The HASP shall describe the known or presumed existing site conditions that may affect worker or public health and safety; the activities that will be taking place within the SMP/GMP affected areas; health and safety requirements; appropriate levels of personal protection required and the criteria for such protection; hygiene; decontamination procedures; training requirements and contingency planning in terms of communication, emergency equipment and emergency planning, as well as any appropriate monitoring or inspection requirements.

Minimum requirements to be included in the HASP include, but are not limited to:

- Description of the specific work areas and impacts associated with the proposed construction activity.
- List of key personnel responsible for site safety, response operations and protection of public health.
- Procedures to control site access.
- Specific description of levels of protection to be worn by personnel in the work area.
- Description of decontamination procedures for personnel and equipment
- Establishment of site specific emergency procedures, including route to nearest medical facility and emergency care for on-site injuries

The contractor shall be responsible for preparing and implementing the HASP in accordance with OSHA 1910(b). In the event that previously unknown conditions are discovered during the course of the construction activities, the contractor shall update and modify the HASP provisions accordingly.

FDEP has compiled templates and guidance for the preparation of HASP for similar cleanup sites. This information can be accessed at the following link:

<http://www.dep.state.fl.us/waste/categories/pcp/pages/safety.htm>

### **3.2 Dust and Sediment Control**

Dust and sediment control measures shall be implemented in compliance with all applicable laws and regulations. During excavation of impacted soil, all exposed soil surfaces within the SMP area (refer to **Figure 5**) shall be kept visibly moist by water spray, or covered with continuous heavy-duty plastic sheeting or other covering to minimize emissions of particulates into the atmosphere. Soil shall not be inundated to the degree that may cause soil migration.

Vehicular access in the SMP area should be controlled and vehicles sprayed prior to exiting the Site as necessary to keep soil onsite and prevent off-site tracking of impacted soil. Parking areas, staging areas, and traffic pathways on the Site shall be cleaned as necessary to control dust emissions. Adjacent public streets shall also be cleaned immediately when soil material from the Site is visible. Soil loaded into

transport vehicles for off-site disposal shall be covered with tarps or other covering to minimize emissions into the atmosphere. The cover shall be in good condition, joined at the seams, and securely anchored.

All soil stockpiles and uncovered soils in the SMP areas shall be managed by appropriate erosion and sediment best management practices (BMPs) in accordance with the project's Erosion Control Plan (ECP) and Stormwater Pollution Prevention Plan (SWPPP). The ECP may be integral to the SWPPP and shall be developed and implemented by the contractor.

### **3.3 Soil Stockpile Management**

Excavated soil from the SMP areas where FDEP SCTL exceedances are known shall be segregated and stockpiled separately from clean soil and placed on top of heavy-duty plastic sheeting. The excavated soil within the subject SMP area shall be stockpiled in a designated area and shall be maintained according to the ECP, applicable regulations and best management practices. A stockpile management system shall be developed prior to earthwork. The origin of the soil in each stockpile shall be documented and the stockpile tracked during relocation and disposal. Each stockpile shall be categorized and numbered. Wherever practical, excavated soil will be stockpiled in areas with improved asphalt or concrete surface and not adjacent to drainage features and water bodies. Soil stockpiles shall be covered with impervious material adequate to prevent soil transport by wind or rainwater runoff. Covers shall be maintained in good condition and inspected daily. When not covered, soil stockpile surfaces shall be kept visibly moist by water spray, as necessary.

### **3.4 Soil Characterization**

Soil with FDEP SCTL exceedances excavated from the SMP areas shall be properly sampled by qualified staff according to the frequency required by the pre-designated disposal facility. As a minimum, sampling frequency shall be conducted as presented in Table A of FDEP Chapter 62-713 F.A.C. Sampling will be conducted for disposal characterization prior to off-site disposal or the future re-use within the Site in accordance with FDEP Standard Operating Procedures (SOP) FS 5000 Waste Sampling per FDEP Chapter 62-160, as appropriate. The qualified staff will report items out of the ordinary and will contact FDEP and the disposal facility, if necessary, to determine the need for additional testing. Soil samples will be analyzed for the presence of the parameters of concern to be determined by the selected disposal facility. Please see **Appendix D** for a copy of an excerpt of the referenced regulatory rule.

### **3.5 Equipment Decontamination**

The contractor must designate a temporary decontamination area within each SMP area. After completing surface and subsurface earthwork, the contractor shall decontaminate the equipment and vehicles that have come in contact with impacted soil by washing off the equipment and excavator buckets with a neutral

surfactant and water mix followed by a water rinse. Decontamination shall be performed when vehicles and equipment are being transferred from one SMP area to another.

### **3.6 Soil Reuse**

Soil re-use is an option under certain circumstances. Soil re-use is defined as the excavation of soil from one location and placement of soil for use as fill in another location within a respective parcel. All soil must remain within the site boundaries, even during re-use activities. Additionally soil excavated within a respective SMP parcel may be reused within that parcel provided that impacted soils are managed as such, and in a manner consistent with the engineering control restrictions applicable to the parcel. Table 3.1 specifically states the SMP provisions that must be followed in each case. Soil for backfill may be imported from off-site sources if soil shortages occur. The contractor will certify and provide supporting documentation that any imported soil is not contaminated prior to arriving onsite.

### **3.7 Waste Disposal**

Soil that is excavated from the SMP area exhibiting parameter concentrations above SCTLs based on analytical results (see Section 3.4) that is not being re-used and requires off-site disposal shall be kept in distinct stockpiles and in accordance with Section 3.3 pending characterization and disposal. Impacted soil will be transported to a FDEP-approved solid waste disposal or treatment facility.

Appropriate vehicles and operating procedures will be used to prevent spillage and leakage of materials from occurring at the Site and en-route to the disposal facility. Trucks shall be securely covered prior to leaving the Site. If materials resulting from leakage or tracking are observed along the adjacent roadways, they shall immediately be cleaned and procedures modified as necessary to prevent recurrence.

### **3.8 Disposal Documentation**

A manifest system shall be used so that impacted soils can be tracked from generation (excavation location, stockpile) to ultimate disposal. The manifests shall comply with all provisions of the appropriate transportation and disposal regulations.

The City will be considered the generator of these wastes. The Contractor shall coordinate manifest signatures with appropriate City personnel.

### **3.9 Tree Removal and Relocation**

Tree removal and relocation may be included as part of the development scope for the Site. Trees shall not be relocated from an impacted parcel to an unrestricted parcel. In the event that tree removal is required within Parcel K and Parcel E, the affected trees will be removed from the root ball as practicable; the roots will be washed off as practical to remove soil within the root area, chipped for use as mulch or off-site disposal. Soil washing shall occur in a designated area and in a manner so as to contain the spread of impacted soil on the ground.

### **3.10 Pre-Construction Meeting**

Prior to initiation of construction activities, a qualified staff member shall conduct a pre-construction meeting with the contractor to identify the area within the Site that was identified as the SMP area and discuss health and safety protocols and other items pertinent to soil management. Visual markers shall be placed to delineate the SMP areas prior to any site work.

## **4.0 GROUNDWATER MANAGEMENT PLAN**

The following GMP has been developed to reduce disturbance and migration of groundwater impacts during construction activities at the Site.

### **4.1 Extent of Groundwater Impacts**

The following information regarding groundwater impacts is based on the information summarized in Section 2.0:

- No groundwater impacts are present within the DRMO Parcel.
- No groundwater impacts are present within Parcel K.
- The presence of petroleum has been documented in Parcels E2 and E3. Groundwater restrictions are applicable to these sub-parcels.
- Groundwater impacts in Parcel E1 have been addressed to meet regulatory criteria and therefore no groundwater restrictions are deemed necessary within this sub-parcel.

Therefore, the GMP provisions are applicable to Parcel E2 and E3 only. The parameters of concern in these areas include petroleum product previously identified in the building 102 and 104 and East Quay areas. Parameters of concern for the building 136 area have not been determined based on the lack of assessment data. However, soil impacts in the area of building 136 included SVOCs, iron and arsenic. Therefore, groundwater parameters of concern for Parcel E2 include SVOC, iron, arsenic and petroleum constituents.

### **4.2 Groundwater Management Provisions**

The following provisions apply to the GMP area:

- The contractor shall obtain all necessary dewatering permits for the project. Dewatering permits as required must be approved by FDEP and the South Florida Water Management District. In addition, a Generic Permit for Discharges from Petroleum Contaminated Sites under Chapter 62-621.300, F.A.C. must be secured by the construction contractor and approved by FDEP prior to dewatering activities in areas with impacted groundwater or areas within 500 feet of known or presumed impacted groundwater. The permit conditions must be enforced. Additional permit conditions may be required based on parameters of concern identified within the GMP.
- Groundwater may not be discharged to a storm drain or sanitary sewer unless in compliance with an approved discharge permit. Discharge into the City Waste Water Treatment Plant will need to meet influent standards and will require prior approval from the City.

- The discharge must be free of floating solids, visible foam, turbidity, or visible oil and must not create nuisances to surface waters.
- If groundwater is extracted, it must be contained, characterized and treated (if required) prior to discharge to a permitted discharge point or disposed off-site.
- Records of groundwater testing and disposal documentation shall be kept on file.
- Groundwater monitoring as required by the Dewatering Permit conditions shall be implemented.
- Groundwater shall not be used for irrigation purposes.
- No water supply wells shall be used onsite.
- Daily logs documenting dewatering activities shall be kept on file.

Please note that additional and specific requirements will be dictated by the permitting agency upon issuing the dewatering permit for the specific proposed dewatering areas.

Also note that dewatering activities conducted within the remaining parcels may affect the migration of the groundwater impacts from Parcels E2 and E3. Therefore, it is possible that depending on the extent of the dewatering conducted within other parcel areas adjacent to Parcel E2 and E3, dewatering restrictions and conditions may be required. It will be incumbent on the contractor to demonstrate that dewatering will not cause migration of impacted groundwater into un-impacted areas.

#### **4.3 Groundwater Monitoring Wells**

Existing monitoring wells must be protected from damage or replaced if damaged or removed during construction. Preconstruction and post-construction surveys of existing monitoring wells shall be conducted. The contractor shall be responsible to replace damaged monitoring wells.

## **5.0 SMP/GMP IMPLEMENTATION AND SUPERVISION**

Prior to commencing work within the Site, the contractor shall complete and certify the Truman Waterfront LUC Area Construction Permit for submittal to the Navy for approval. The permit application shall also be submitted to FDEP for review and concurrence. The permit application form is included in **Appendix E**. This permit includes a certification that the permittee will obtain a copy of this SMP/GMP document and implement the protocols and measure described herein.

An environmental professional will be designated by the City of Key West to observe and document the construction activities as they relate to the proper soil and groundwater management and compliance with this SMP/GMP. This designated professional will conduct periodic site visits and document activities, as well as report back to the City regarding additional management measures required or improper techniques observed. This observation will be conducted on behalf of the City and does not exempt the contractor for responsibility to implement and enforce the SMP and GMP provision, nor does it substitute or exclude the notification and record keeping requirements set forth in Section 6.0 of this document.

Please note that the City will not be responsible for enforcement and implementation of the HASP.

## 6.0 RECORD KEEPING AND NOTIFICATIONS

Based on the presence of impacts at the Site, site contractor personnel shall document the soil and groundwater disposal practices, soil re-use activities as well as document health and safety protocols and routine briefings. The following records shall be kept on file for submittal to the City, the Navy and FDEP upon completion of development or as requested during construction activities:

- Manifests for disposal of impacted soil or groundwater.
- Laboratory analytical reports for soil and groundwater testing performed during development.
- Documentation regarding clean fill brought to the Site during development.
- Records of damaged monitoring wells and well replacement activities, if applicable.
- Daily logs of soil removed from the Site for off-site disposal.
- Documentation of stockpile tracking.
- Records of communication regarding unforeseen environmental conditions encountered.
- Records of discovery of soil staining or discoloration, or odor. This information will include descriptions of the observations, locations, notifications, as well as course of action implemented.

Questions regarding environmental conditions or discovery of potential environmental conditions not included here can be addressed to the Mr. James Bouquet with the City of Key West at (305) 809-3962 and [jbouquet@cityofkeywest-fl.gov](mailto:jbouquet@cityofkeywest-fl.gov).

## 7.0 REFERENCES

CH2M HILL, *Annual Status Report Petroleum Recovery Program December 2005 to December 2006 Monthly Status Report January 2007 for Trumbo Point Fuel Farm and Truman Annex Buildings 102 and 103*, May 2007

CH2M HILL, *Site Rehabilitation Completion Report Soil Removal Actions at the City-Owned Portion of Parcel K, Naval Air Station Key West, Key West, Florida*, April 2014

FDEP, *correspondence regarding approval of Site Rehabilitation Completion Report Soil Removal Actions at the City-Owned Portion of Parcel K*, June 4, 2014

TetraTech, *BRAC Five Year Review for Six BRAC Environmental Sites Naval Air Station Key West*, April 2014

CH2M HILL, *Site Rehabilitation Completion Report Former Defense Reutilization and Marketing Office Truman Annex, Naval Air Station Key West, Key West, Florida*, December 2010

Naval Facilities Engineering Southern Division Command, *Finding of Suitability to Transfer Truman Annex Parcels*, Naval Air Facility, Key West, Florida,

*Draft Teleconference Notes (version 2), meeting held by FDEP, BRAC, NAVFAC and NAS*, April 14, 2014

*Proposed Plan for Soil Remedy at Truman Annex Buildings 102 And 104 Naval Air Station*, September 19, 1999

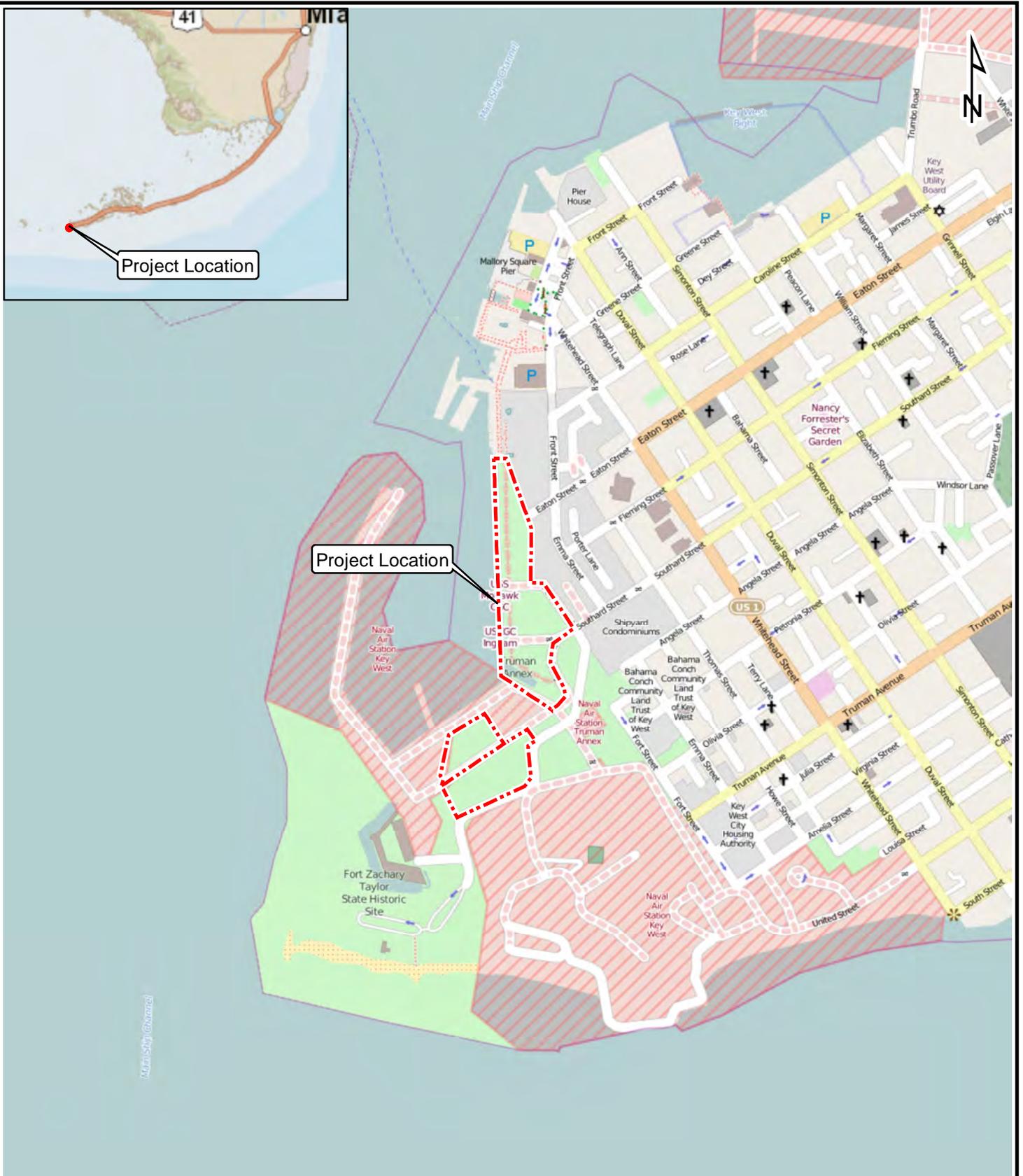
*Proposed Plan for Soil Remedy at Truman Annex Buildings 103 Naval Air Station*, September 19, 1999

*Proposed Plan for Soil Remedy at Truman Annex Buildings 136 Naval Air Station*, September 19, 1999

FDEP, *Site Rehabilitation Completion Order, Building 189, Naval Air Station Key West, Key West, Florida*, August 7, 2001

County of Monroe, *Quitclaim Deed, December 3, 2002*

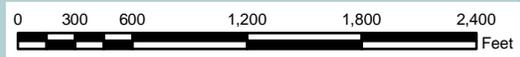
# FIGURES



Background Source: ESRI Street Map

**Legend**

 Project Location




E Sciences, Incorporated  
 FL Engineering Lic. #8691  
 224 SE 9th Street  
 Ft. Lauderdale, Florida 33316  
 www.esciencesinc.com  
 Phone: 954-484-8500  
 Fax: 954-484-5146

# Truman Waterfront Park

Section 6, Township 68S, Range 25E  
 Key West, Monroe County, Florida

Location Map

FIGURE

# 1

DRAWN BY: TV	CHECKED BY: MP	PROJECT NUMBER: 7-0070-002
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SCALE: 1"=1,000'	DATE: 8/28/2014
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P:\Projects\7-0000-00917-0070-002\4\_figures and drawings\GIS1. Location Map.pxd



Background Source: BING 2012

**Legend**  
 Project Location



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# Truman Waterfront Park

Section 6, Township 68S, Range 25E  
 Key West, Monroe County, Florida

Aerial Photograph

SCALE: 1"=350'

DATE: 8/28/2014

FIGURE

# 2

DRAWN BY: TV

CHECKED BY: MP

PROJECT NUMBER: 7-0070-002



Background Source: BING 2012

**Legend**  
[Red dashed line symbol] Project Location Former building locations are approximate based on historical documents.




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# Truman Waterfront Park

Section 6, Township 68S, Range 25E  
Key West, Monroe County, Florida

Parcel Reference Map

SCALE: 1"=350' DATE: 10/23/2014

FIGURE

# 3

DRAWN BY: LG	CHECKED BY: MP	PROJECT NUMBER: 7-0070-002
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# Truman Waterfront Park

THE CITY OF KEY WEST  
DATE: 04-14-2014



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DRAWN BY: LG	CHECKED BY:	PROJECT NUMBER: 7-0070-002
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## Truman Waterfront Park

Section 6, Township 68S, Range 25E  
 Key West, Monroe County, Florida

Proposed  
 Development Plan  
 September 2014

SCALE: NTS	DATE: 10/8/2014
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FIGURE  
4

Soil and Groundwater Impacts and SMP/GMP Summary		
Impacts		Provisions
No Impacts	• No Impacts	•No import of soil from other parcels. •No re-use of soil beyond parcel boundaries.
Surface Soil	• Meets site-specific Recreational SCTLs •Above FDEP SCTLs	•No re-use of soil beyond parcel boundaries. •Subject to SMP provisions presented in Section 3.0 of Soil and Groundwater Management Plan dated February 6, 2015..
Subsurface Soil	•Above FDEP SCTLs	•No re-use of soil beyond parcel boundaries •Subject to SMP provisions presented in Section 3.0 of Soil and Groundwater Management Plan dated February 6, 2015..
Surface Soil	•No Impacts	•No import of soil from other parcels. •No re-use of soil beyond parcel boundaries.
Subsurface Soil	•Above FDEP SCTLs	•Subsurface soil excavated shall not be used above 2 feet bls within the parcel boundaries unless covered with an engineering control. •No re-use of soil beyond parcel boundaries. •If excavated, upper two feet must be replaced with a minimum of two feet of non-impacted soil or alternative engineering control. •Subject to SMP provisions presented in Section 3.0 of Soil and Groundwater Management Plan dated February 6, 2015.
Groundwater	•Groundwater Impacts documented.	•Subject to GMP provisions presented in Section 4.0 of Soil and Groundwater Management Plan dated February 6, 2015.
Surface Soil	•Above FDEP SCTLs	•Soil must be excavated or covered with appropriate engineering controls. •No re-use of soil beyond parcel boundaries. •Subject to SMP provisions presented in Section 3.0 of Soil and Groundwater Management Plan dated February 6, 2015..
Subsurface Soil	•Above FDEP SCTLs	•Soil must be excavated or covered with appropriate engineering controls. •No re-use of soil beyond parcel boundaries. •Subject to SMP provisions presented in Section 3.0 of Soil and Groundwater Management Plan dated February 6, 2015.
Groundwater	•Groundwater Impacts documented.	•Subject to GMP provisions presented in Section 4.0 of Soil and Groundwater Management Plan dated February 6, 2015.

Note: Refer to the SMP/GMP text for additional information.



Background Source: BING 2012

**Legend**

Project Location

E Sciences, Incorporated  
 FL Engineering Lic. #8691  
 224 SE 9th Street  
 Ft. Lauderdale, Florida 33316  
 www.esciencesinc.com  
 Phone: 954-484-8500  
 Fax: 954-484-5146

**Truman Waterfront Park**

Section 6, Township 68S, Range 25E  
 Key West, Monroe County, Florida

SMP and GMP  
 Reference Map

SCALE: 1"=350'      DATE: 2/6/2015

FIGURE  
**5**

P:\Projects\7-0000-0099\7-0070-0024\_figures and drawings\GIS\SMP Reference Map.mxd

DRAWN BY: LG      CHECKED BY: MP      PROJECT NUMBER: 7-0070-002

# APPENDIX A

**From:** [James Bouquet](#)  
**To:** [Barney, David A CIV NAVFACHQ, BRAC PMO](#)  
**Cc:** [dcraig@keywestcity.com](#); [dbradsha@keywestcity.com](#); [rhollingworth@bermelloajamil.com](#); [Nadia Locke](#); [Amy.Twitty@CH2M.com](#); [Vaught,Tracie \(Tracie.Vaught@dep.state.fl.us\)](#); [Fielding, Thuane B CIV NAVFAC HQ, BRAC PMO](#); [aperez@perezeng.com](#); [Gary Volenec](#)  
**Subject:** RE: Truman Waterfront Parcel Restrictions  
**Date:** Tuesday, October 07, 2014 11:32:43 AM

---

David:

Yes, the existing survey does indicate a "gas line" running under the pier. Our original intent was to remove all of the concrete pavement and replace with new patterned concrete and landscaping. Based on your email, the Navy will now require that soil along the quay not covered with pavement will be under a 2 foot cap (or geomembrane layer) similar to sub-parcel E2, correct?

Are there asbuilts or information available that indicate the extent of soil removal and clean backfill replacement? Again, our plans for this area are primarily surficial and the knowledge that several feet of clean soil existing at the surface would be important from a design, soil management plan and ultimately cost perspective.

Jim

-----Original Message-----

From: Barney, David A CIV NAVFACHQ, BRAC PMO

[<mailto:david.a.barney@navy.mil>]

Sent: Tuesday, October 07, 2014 11:10 AM

To: James Bouquet

Cc: [dcraig@keywestcity.com](#); [dbradsha@keywestcity.com](#);

[rhollingworth@bermelloajamil.com](#); [nlocke@esciencesinc.com](#);

[Amy.Twitty@CH2M.com](#); Vaught,Tracie ([Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us)); Fielding, Thuane B CIV NAVFAC HQ, BRAC PMO

Subject: RE: Truman Waterfront Parcel Restrictions

Jim,

As I currently understand the circumstances of the Truman Waterfront Parcel Restrictions, the Navy generally agrees with the summary provided below for sub-parcels E1 and E2. However, regarding sub-parcel E3 (the pier) after further discussions it is my understanding that circa 1988, the East Seawall (the pier) was expanded seaward. A significant amount of earthwork was required to tie the new seawall into existing deadmen that anchor the wall. The long tie-rods were replaced during which work a Navy fuel line was identified in the work area. Several thousand cubic yards of petroleum contaminated soil were removed and taken off site as part of this construction activity. However, at this time, the Navy and FDEP have not been able to locate any reports describing the petroleum contaminated soil removal (nature and extent, potential impact to groundwater) or any analytical information on the new fill brought in for the expansion of the seawall. Until such information can be obtained, and concurrence provided to eliminate necessary land use controls, we recommend including appropriate handling of the soil and groundwater at sub-Parcel E3 in your soil management plan.

r/

David Barney  
BRAC Environmental Coordinator  
Naval Facilities Engineering Command  
BRAC Program Management Office East  
571 Shea Memorial Drive  
South Weymouth, MA 02190

Phone: 617-753-4656  
US Mail Address: PO Box 169  
Email: [david.a.barney@navy.mil](mailto:david.a.barney@navy.mil)

-----Original Message-----

From: James Bouquet [<mailto:jbouquet@cityofkeywest-fl.gov>]  
Sent: Tuesday, September 30, 2014 3:44 PM  
To: Barney, David A CIV NAVFACHQ, BRAC PMO  
Cc: [dcraig@keywestcity.com](mailto:dcraig@keywestcity.com); [dbradsha@keywestcity.com](mailto:dbradsha@keywestcity.com);  
[rhollingworth@bermelloajamil.com](mailto:rhollingworth@bermelloajamil.com); [nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com)  
Subject: RE: Truman Waterfront Parcel Restrictions

Thanks David and I look forward to working with you.

Let me know what the City or our consulting team can do to expedite the process.

Jim

-----Original Message-----

From: Barney, David A CIV NAVFACHQ, BRAC PMO  
[<mailto:david.a.barney@navy.mil>]  
Sent: Tuesday, September 30, 2014 3:36 PM  
To: James Bouquet  
Subject: RE: Truman Waterfront Parcel Restrictions

Hi Jim,

I am working with one of our Real Estate Specialist (Stephanie Zamorski) on the survey/legal description concerns. I am also working with Amy to better understand the LUC descriptions and what needs to be communicated to, and received from, FDEP to follow up on the bullet points from the initial email from Maria Paituvi below.

r/

David Barney  
BRAC Environmental Coordinator  
Naval Facilities Engineering Command  
BRAC Program Management Office East  
571 Shea Memorial Drive  
South Weymouth, MA 02190

Phone: 617-753-4656  
US Mail Address: PO Box 169  
Email: [david.a.barney@navy.mil](mailto:david.a.barney@navy.mil)

-----Original Message-----

From: James Bouquet [<mailto:jbouquet@cityofkeywest-fl.gov>]  
Sent: Tuesday, September 30, 2014 2:58 PM  
To: Barney, David A CIV NAVFACHQ, BRAC PMO  
Subject: FW: Truman Waterfront Parcel Restrictions

David B

Should have directed this to you.

I will be asked why/when was it determined that the City was responsible for surveying/legal descriptions of the environmental parcels? I can see the City preparing descriptions for utility easements effected by the proposed project, but not sure how that relates to the Navy's environmental work?

Jim

-----Original Message-----

From: Criswell, David CIV NAVFAC HQ, BRAC PMO [<mailto:david.criswell@navy.mil>]  
Sent: Tuesday, September 30, 2014 9:35 AM  
To: James Bouquet; Barney, David A CIV NAVFACHQ, BRAC PMO  
Cc: [nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com); [Amy.Twitty@ch2m.com](mailto:Amy.Twitty@ch2m.com);  
[rhollingworth@bermelloajamil.com](mailto:rhollingworth@bermelloajamil.com); [dbradsha@keywestcity.com](mailto:dbradsha@keywestcity.com);  
[dcraig@keywestcity.com](mailto:dcraig@keywestcity.com); James K. Scholl; [mpaituvi@esciencesinc.com](mailto:mpaituvi@esciencesinc.com); Preston, Gregory C CIV NAVFACHQ, BRAC PMO; [tracie.vaught@dep.state.fl.us](mailto:tracie.vaught@dep.state.fl.us); Zamorski, Stephanie CIV NAVFACHQ, BRAC PMO  
Subject: RE: Truman Waterfront Parcel Restrictions

Jim,

Thank you for reaching out to the "New Dave". One thing I wanted to remind the City of is the need for a survey for each parcel on which the Navy will be releasing the restrictions. Most pressing is the release of restrictions for Parcel K. The Navy needs a survey specific to the Parcel where we are releasing the restrictions. Similar surveys will be needed for the DRMO Parcel and the Parcel E subparcels. Please work with Dave Barney and Amy Twitty to coordinate the requirements.

It has been a pleasure to work with you all and I look forward to visiting Key West again to see the new park!

David Criswell

-----Original Message-----

From: James Bouquet [<mailto:jbouquet@cityofkeywest-fl.gov>]  
Sent: Tuesday, September 30, 2014 8:17 AM

To: Barney, David A CIV NAVFACHQ, BRAC PMO  
Cc: [nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com); [Amy.Twitty@ch2m.com](mailto:Amy.Twitty@ch2m.com);  
[rhollingworth@bermelloajamil.com](mailto:rhollingworth@bermelloajamil.com); [dbradsha@keywestcity.com](mailto:dbradsha@keywestcity.com);  
[dcraig@keywestcity.com](mailto:dcraig@keywestcity.com); James K. Scholl; [mpaituvi@esciencesinc.com](mailto:mpaituvi@esciencesinc.com); Criswell,  
David CIV NAVFAC HQ, BRAC PMO; Preston, Gregory C CIV NAVFACHQ, BRAC PMO;  
[tracie.vaught@dep.state.fl.us](mailto:tracie.vaught@dep.state.fl.us)  
Subject: FW: Truman Waterfront Parcel Restrictions

David:

My name is Jim Bouquet and I am the City of Key West Project Manager for the Truman Waterfront Park Project. As David Criswell is retiring, I am forwarding you this email chain regarding preparation of a draft Soil Management Plan/Groundwater Management Plan to support construction of the proposed park.

As indicated below, Nadia Locke of E-Sciences (the project's environmental consultant) has requested the Navy's conformation of the proposed land use controls (LUCs) for the Truman site, specially as related to the proposed Parcel E subdivisions. Our understanding of these LUCs are based on a presentation by the Navy at the July RAB meeting held in Key West and subsequent discussions with the Navy's consultant CH2M Hill (Amy Twitty). Note that FDEP (Tracie Vaught) has concurred with the proposed LUCs.

We would like to submit a draft Soil Management /Groundwater Management Plan to both the Navy and FDEP during October for review and comment. To meet this schedule, your timely feedback to this email will be appreciated. As you are aware, this Plan and agreement on the LUCs are critical to revising/amending the existing deed for the Site, which will be required prior to commencing construction planned for early Summer 2016.

Feel free to contact and discuss directly with Nadia and her team.

It is our understanding that the BRAC Program Management Office (Greg Preston) will be taking the lead in revising the existing deed. Please let me know if you require additional information from the City to expedite this process.

Thanks and please contact me with any questions.

Jim Bouquet, P.E.

305.809.3962

From: Vaught, Tracie [<mailto:Tracie.Vaught@dep.state.fl.us>  
<<mailto:Tracie.Vaught@dep.state.fl.us>> ]  
Sent: Tuesday, September 23, 2014 1:55 PM  
To: Criswell, David CIV NAVFAC HQ, BRAC PMO; [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com)  
<<mailto:Amy.Twitty@CH2M.com>> ; James Bouquet; Randy Hollingworth;  
[nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com) <<mailto:nlocke@esciencesinc.com>>  
Cc: Barney, David A CIV NAVFACHQ, BRAC PMO  
Subject: RE: Truman Waterfront Parcel Restrictions

The descriptions provided below are correct. I would like to emphasize that the groundwater does have a land use control which will require the groundwater to be handled accordingly if it is impacted in any way during the construction of the Truman Annex Park. The only documents that have been provided with official DEP approval are documents that you already have in your possession.

Respectfully,

Tracie L. Vaught

Bob Martinez Center

2600 Blairstone Road

Mail Station 4535

Tallahassee, Florida, 32399

[Tracie.vaught@dep.state.fl.us](mailto:Tracie.vaught@dep.state.fl.us) <<mailto:Tracie.vaught@dep.state.fl.us>>

Office number (850) 245-8998

-----Original Message-----

From: Criswell, David CIV NAVFAC HQ, BRAC PMO [<mailto:david.criswell@navy.mil> <<mailto:david.criswell@navy.mil>> ]  
Sent: Tuesday, September 23, 2014 1:04 PM  
To: Vaught,Tracie  
Subject: FW: Truman Waterfront Parcel Restrictions

-----Original Message-----

From: Maria Paituvi [<mailto:mpaituvi@esciencesinc.com> <<mailto:mpaituvi@esciencesinc.com>> ]

Sent: Tuesday, September 23, 2014 11:05 AM

To: Criswell, David CIV NAVFAC HQ, BRAC PMO; [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) <<mailto:Amy.Twitty@CH2M.com>>

Cc: Nadia Locke; [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com) <<mailto:jbouquet@keywestcity.com>> ;  
Randy Hollingworth ([RHollingworth@bermelloajamil.com](mailto:RHollingworth@bermelloajamil.com) <<mailto:RHollingworth@bermelloajamil.com>> )

Subject: Truman Waterfront Parcel Restrictions

Good afternoon David and Amy,

Thank you for providing us with so much information to assist us with preparing the soil management plan for the Truman Waterfront Project. We have reviewed the extensive documentation you have provided. We feel as though we have a good handle on Parcel K and the DRMO parcel. As you already know, Parcel E is the challenging part. We believe that we are at a point where we could use your assistance once again by reviewing our understanding and providing confirmation or clarification.

Based on documents provided and additional information provided by the City, this

is our current understanding of the existing and proposed restrictions on Parcel E for your review and confirmation:

. The parcel was subdivided into Parcels E1, E2 and E3 in order to separate areas with different types of restrictions in order to facilitate the development of the proposed park.

o Parcel E1: This site (Building 189) received an SRCO and therefore can be considered as a clean site (soil and groundwater) for the purpose of development. No soil or groundwater management provision will be required for this site during construction of the proposed park and there will be no land use controls.

o Parcel E2: This site includes former Buildings 102, 103, 104 and 136. Historical soil impacts above 2 feet have been addressed to residential standards. Soil impacts remain below 2 feet. Therefore, soil management provisions will address the presence of impacted soil below 2 feet by maintaining the existing engineering control of two feet of clean fill across Parcel E2. Groundwater use restrictions will remain in place but there will be no land use restrictions that will prevent use of this parcel as a recreational park and playground as long as the engineering control remains in place.

o Parcel E3: No soil or groundwater impacts are present. Therefore, no soil or groundwater management restrictions will be required.

. We understand that FDEP was engaged in the discussions during a meeting that occurred in July 2014 where it was agreed by all parties that the Navy and City would employ different land use controls of those subparcels separately and that FDEP concurs in concept with the information presented above. We further understand that the development and use of the proposed park is allowable and that there will be no land use restrictions to prevent this type of land use. Are there meeting minutes or any other type of documentation confirming FDEP's concurrence?

. It is the City's understanding that BRAC will be revising the deeds for Parcel E2 and Parcel K to allow for recreational use, and the deeds for Parcels E1, E3 and the DRMO parcel to remove all land use restrictions.

We understand that the history and regulatory interaction for this site is complex and we appreciate your cooperation and insight as we try to develop the soil management plan and convey this information in the most efficient and clear manner.

Please don't hesitate to call us to discuss.

Thank you,

Maria Paituvi, P.E.

Senior Engineer

Description: Description:  
C:\Users\mpaituvi\AppData\Roaming\Microsoft\Signatures\image001.jpg

224 SE 9th Street

Fort Lauderdale, FL 33316

954/484-8500 Telephone

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[mpaituvi@esciencesinc.com](mailto:mpaituvi@esciencesinc.com) <<mailto:mpaituvi@esciencesinc.com>>  
<<mailto:mpaituvi@esciencesinc.com> <<mailto:mpaituvi@esciencesinc.com>> >

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<<http://www.esciencesinc.com/> <<http://www.esciencesinc.com/>> >

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Miami-Dade County CBE, SFWMD SBE

Image removed by sender. <<http://survey.dep.state.fl.us/?refemail=Tracie.Vaught@dep.state.fl.us>>

To: [nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com) [Remove](#) this sender from my allow list

From: [jbouquet@cityofkeywest-fl.gov](mailto:jbouquet@cityofkeywest-fl.gov)

*You received this message because the sender is on your allow list.*

## Maria Paituvi

---

**From:** Amy.Twitty@CH2M.com  
**Sent:** Tuesday, September 09, 2014 4:13 PM  
**To:** Maria Paituvi; Nadia Locke  
**Cc:** jbouquet@keywestcity.com; david.criswell@navy.mil; art.sanford.ctr@navy.mil  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents  
**Attachments:** D Scale drawing Pages from Project Completion Rpt\_DRMO.pdf; Figure 2-7 EC-G from Project Completion Rpt\_DRMO-2.pdf

Maria – Regarding your first bullet below, please refer to Figure 8 (Summary of Risk-Based Corrective Action Analysis Technical Memorandum) which shows the residual BEQ concentrations from 2 to 4 feet bls. We compared those BEQ results to leachability criteria (8 mg/kg) and all were below; therefore, no removal actions were necessary based on BEQs. However, some results exceeded residential (0.1 mg/kg), recreational (0.35 mg/kg), and industrial (0.7 mg/kg) criteria for BEQs (although it appears some of our color coding is incorrect for some samples). Thus, in the event that subsurface soil >2 ft bls is excavated and brought to the surface, direct exposure to these soils could become an issue and would need to be managed accordingly.

Regarding the second bullet, I have a copy of a 2006 Tech Memo Former DRMO Site. I have uploaded it to the same ftp site as before:

<https://transfer.ch2m.com>

Then find the “pub” folder and then the “KeyWestDocs” folder. I’m not sure if this full link will work but you can try it (I am an internal client so I can’t test it):

<https://transfer.ch2m.com/pub/KeyWestDocs>

Please note this week’s user ID and Password is:

Username = **ext\Innovation**

Password = **ehulem45**

And yes, iron is the only gw COC.

For your third bullet, this one is a little trickier! I have some free product recovery reports that include Parcel E that I will look for. At a minimum, the portion of Parcel E associated with Building 189 received a Site Rehabilitation Completion Order from FDEP and should remove LUCs from Building 189 and north (not sure there was ever anything to the north anyway). The arsenic left in soil near Building 136 was removed during the DRMO excavation activities (you have that completion report). See figures attached regarding the Engineering Control area G (EC-G) that was removed to 2 ft. The SI (1998) and SSI (1999) reports show some of the soil maps from Parcel E. You also have these reports.

More to follow...



---

**From:** Maria Paituvi [mailto:mpaituvi@esciencesinc.com]  
**Sent:** Monday, September 08, 2014 9:49 AM  
**To:** Twitty, Amy/NVR; Nadia Locke  
**Cc:** jbouquet@keywestcity.com  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Hello Amy,

Thank you for all the files. We are trying to sort through the directly relevant information as it is available in order to prepare the Soil and Groundwater Management Plan for the development of the Truman Waterfront Park. That is why we requested information and documents associated with soil and groundwater delineation for DRMO, Parcel K and Parcel E as they would assist us greatly of depicting an accurate description of the site conditions and allow us to develop the appropriate management measures accordingly. Based on the information reviewed, we have the following understanding:

- Parcel K meets Recreational standards above 2 ft bls and there is no residual contamination above Residential standards below 2 ft. Therefore, we can draft the soil management plan under the provision that only soil above 2 ft is impacted above residential standards. We understand that this site was subject a Risk Based Corrective Action as documented on the Summary of Risk-Based Corrective Action Analysis Technical Memorandum prepared by CH2M Hill dated August 13, 2010. The groundwater is not impacted and there will be no groundwater controls necessary on Parcel K.
- For the DRMO, excavation efforts addressed the surface and subsurface soil impacts and the site meets residential standards. Historical assessment was based on risk characterization and assessment documented in Decision Document for Ten Base Realignment and Closure (BRAC) Sites by TetraTech dated April 2002 and Technical Memorandum – Former DRMO Site prepared by CH2M Hill dated 2007. Could we request a copy of the 2007 CH2M Hill document? We understand that besides the iron, there are no issues related to groundwater and it is anticipated that once this is resolved there will be no LUCs on groundwater.
- We are still trying to locate updated information regarding the groundwater contamination in Parcel E and the delineated soil impacts there. I understand the that entire site is restricted for non-residential use. Are we to assume that all soil at the Site is impacted above residential standards or are there delineation areas available? Based on Decision Document for Ten Base Realignment and Closure (BRAC) Sites by TetraTech dated April 2002, soil impacts at Building 102, 103 and 104 had been addressed and no further action was supported by a residual risk assessment performed for those sites. Arsenic soil contamination remained at the Building 136 site and engineering controls were implemented there. Are there maps that depict where contaminated soil was removed and contaminated soil remains? We could not locate documents regarding groundwater assessment and remediation. Are there maps that depict the groundwater or free product plumes delineations?

If you could confirm the information above and provide any additional clarification and documentation (specially on Parcel E) it will be greatly appreciated.

I am always available to talk, so don't hesitate to call me if you want to discuss any of this information.

Thank you,

**Maria Paituvi, P.E.**  
**Senior Engineer**



224 SE 9<sup>th</sup> Street  
Fort Lauderdale, FL 33316  
954/484-8500 Telephone  
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Orlando - Fort Lauderdale - Miami - DeLand

## Miami-Dade County CBE, SFWMD SBE

---

**From:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) [<mailto:Amy.Twitty@CH2M.com>]  
**Sent:** Friday, August 29, 2014 11:42 AM  
**To:** Maria Paituvi; Nadia Locke  
**Cc:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Also note in the 2010 DRMO SRCR Section 2 describes the final excavation to remove soil contamination from 2 to 3 feet to meet residential (not recreational) criteria.



---

**From:** Maria Paituvi [<mailto:mpaituvi@esciencesinc.com>]  
**Sent:** Tuesday, August 26, 2014 9:04 PM  
**To:** Twitty, Amy/NVR; Nadia Locke  
**Cc:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Hello Amy,

Thank you for providing us with all the valuable information and documents for this project. At this time we have a few more specific questions that I was hoping you might be able to assist us with. The information listed below would assist us better prepare the soil management plan:

- Groundwater impacts have been documented in Building 102, 103 and 104 in Parcel E. The latest groundwater data we have located was included in Free Product Recovery Program Summary Continued Compliance Monitoring – 4<sup>th</sup> Additional Quarter (March 2005 – May 2005) Compliance Monitoring Results Trumbo Point Fuel Farm, USGC and Navy Piers and Truman Annex Building 103 prepared by CH2M HILL. This document included a figure depicting Free Product Areas but no groundwater contamination plume areas were identified. To your knowledge, is there later data available?
- The DRMO site has a lot of history. Overall it appears that only the top 2 feet of surface soil have been addressed in order to pursue the LUC for recreational use. Do you know if there are soil delineation

maps available for the soil contamination below 2 feet? The SRCR dated December 2010 includes excavation maps and extensive background information but it would help us greatly to identify the specific areas where soil impacts remain below 2 ft bls.

- Regarding Parcel K, the SRCR dated April 2014 stated that impacted surface and subsurface soil was removed from the site and the site has been addressed to Recreational standards. For this site, it would also be helpful to locate any available delineation maps for the impacts remaining on the site below the excavation depth.

We would really appreciate any help and assistance you might be able to provide. The files are both numerous and extensive so any insight you can provide to locate the above information would be greatly appreciated. The information provided above is based on our cursory review of the files available.

Please contact me with any questions or comments.

Thank you,

**Maria Paituvi, P.E.**  
Project Engineer



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[www.esciencesinc.com](http://www.esciencesinc.com)

Orlando - Fort Lauderdale - Miami - DeLand  
**Miami-Dade County CBE, SFWMD SBE**

---

**From:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) [Amy.Twitty@CH2M.com]  
**Sent:** Monday, August 25, 2014 11:59 AM  
**To:** Maria Paituvi; Nadia Locke  
**Cc:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Glad to hear it. Sorry for the confusion.

---

**From:** Maria Paituvi [<mailto:mpaituvi@esciencesinc.com>]  
**Sent:** Monday, August 25, 2014 10:58 AM  
**To:** Twitty, Amy/NVR; Nadia Locke  
**Cc:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Thanks Amy,  
We were able to locate and download the documents under the link provided.  
Regards,

**Maria Paituvi, P.E.**  
Project Engineer



224 SE 9<sup>th</sup> Street  
Fort Lauderdale, FL 33316  
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[www.esciencesinc.com](http://www.esciencesinc.com)  
Orlando - Fort Lauderdale - Miami - DeLand

**Miami-Dade County CBE, SFWMD SBE**

---

**From:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) [<mailto:Amy.Twitty@CH2M.com>]  
**Sent:** Monday, August 25, 2014 10:03 AM  
**To:** Nadia Locke  
**Cc:** Maria Paituvi; [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Sorry about that. Many computer issues for me last week. Try this:

<https://transfer.ch2m.com>

Then find the "pub" folder and then the "KeyWestDocs" folder. I'm not sure if this full link will work but you can try it (I am an internal client so I can't test it):

<https://transfer.ch2m.com/pub/KeyWestDocs>

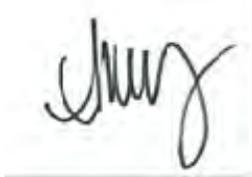
Please note this week's user ID and Password below"

Public READ ONLY Password

Username = **ext\Innovation**

Password = **osiwox77**

Last changed on 8/25/2014 12:00:06 AM, MT



---

**From:** Nadia Locke [<mailto:nlocke@esciencesinc.com>]

**Sent:** Monday, August 25, 2014 6:09 AM

**To:** Twitty, Amy/NVR

**Cc:** Maria Paituvi

**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Hi Amy. I don't recall hearing back. Can you please send the updated link when you have a moment? Thank you!

Nadia

**Nadia G. Locke, P.E., LEED AP ND**  
Associate



ENGINEERING  
ENVIRONMENTAL  
ECOLOGICAL

Miami-Dade County CBE, SFWMD SBE

224 SE 9<sup>th</sup> Street

Fort Lauderdale, FL 33316 [MAP](#)

954/484-8500 Telephone

954/484-5146 Fax

954/937-9678 Cell

[nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com)

[www.esciencesinc.com](http://www.esciencesinc.com)

Orlando — Fort Lauderdale— Miami — DeLand

---

**From:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) [<mailto:Amy.Twitty@CH2M.com>]

**Sent:** Thursday, August 21, 2014 3:08 PM

**To:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com); Nadia Locke

**Cc:** Maria Paituvi; Justin Freedman

**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Sorry. I will send another link.



---

**From:** James Bouquet [<mailto:jbouquet@keywestcity.com>]  
**Sent:** Thursday, August 21, 2014 2:06 PM  
**To:** Nadia Locke; Twitty, Amy/NVR  
**Cc:** Maria Paituvi; Justin Freedman  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Me neither

---

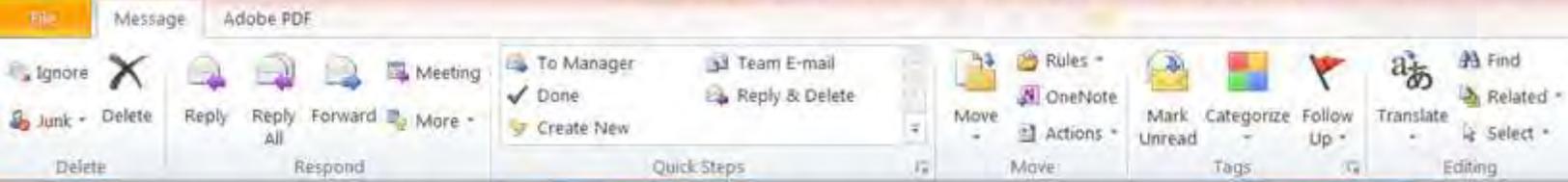
**From:** Nadia Locke [<mailto:nlocke@esciencesinc.com>]  
**Sent:** Thursday, August 21, 2014 2:41 PM  
**To:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com); [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Cc:** Maria Paituvi; Justin Freedman  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Hello Amy

Please see my screenshot below. My computer is indicating that it cannot find the filepath to the public website. Can you please check and resend it? Thanks for your help!

Nadia

**Nadia G. Locke, P.E., LEED AP ND**  
**Associate**



You forwarded this message on 8/20/2014 4:04 PM.

From: Amy.Twitty@CH2M.com  
To: jbouquet@keywestcity.com  
Cc: Nadia Locke; david.criswell@navy.mil; Tracie.Vaught@dep.state.fl.us; dcraig@keywestcity.com; RHollingworth@bermelloajamil.com  
Subject: RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

- 1998 Site Inspection Report for Nine BRAC Parcels
- 1999 Supplemental Site Inspection Report for BRAC Parcels
- 1999 Project Completion Report for BRAC Parcels Fast Track Soil Removals
- 2002 Decision Document for Ten BRAC Sites
- 2007 Project Completion Report for Excavation of PCB and Lead-contaminated Soil at the Former Defense Reutilization and Marketing Office

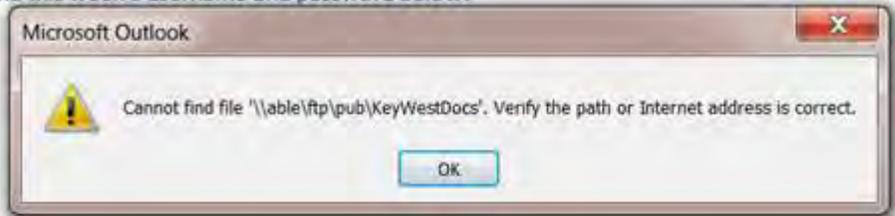
I'll continue to search and upload documents when I can. Link and this week's username and password below:

### CH2M HILL Public FTPS Site

<\\able\ftp\pub\KeyWestDocs>

Public READ ONLY Password  
Username = **extlInnovation**  
Password = **agokal41**

Please note the password changes every Sunday at midnight, MT.



Click on a photo to see social network updates and email messages from this person.



**ENGINEERING  
ENVIRONMENTAL  
ECOLOGICAL**

Miami-Dade County CBE, SFWMD SBE

224 SE 9<sup>th</sup> Street  
Fort Lauderdale, FL 33316 [MAP](#)  
954/484-8500 Telephone  
954/484-5146 Fax  
954/937-9678 Cell  
[nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com)

[www.esciencesinc.com](http://www.esciencesinc.com)

**From:** [Amy.Twitty@CH2M.com](mailto:Amy.Twitty@CH2M.com) [<mailto:Amy.Twitty@CH2M.com>]  
**Sent:** Monday, August 18, 2014 4:35 PM  
**To:** [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Cc:** Nadia Locke; [david.criswell@navy.mil](mailto:david.criswell@navy.mil); [Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us); [dcraig@keywestcity.com](mailto:dcraig@keywestcity.com); [RHollingworth@bermelloajamil.com](mailto:RHollingworth@bermelloajamil.com)  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

I have placed a few reports on our public ftp site. These include:

- 1998 Site Inspection Report for Nine BRAC Parcels
- 1999 Supplemental Site Inspection Report for BRAC Parcels
- 1999 Project Completion Report for BRAC Parcels Fast Track Soil Removals
- 2002 Decision Document for Ten BRAC Sites
- 2007 Project Completion Report for Excavation of PCB and Lead-contaminated Soil at the Former Defense Reutilization and Marketing Office

I'll continue to search and upload documents when I can. Link and this week's username and password below:

## CH2M HILL Public FTPS Site

[\\able\ftp\pub\KeyWestDocs](ftp://able\ftp\pub\KeyWestDocs)

Public READ ONLY Password  
Username = **ext\Innovation**  
Password = **agokal41**  
Please note the password changes every Sunday at midnight, MT.



---

**From:** James Bouquet [<mailto:jbouquet@keywestcity.com>]  
**Sent:** Monday, August 18, 2014 12:38 PM  
**To:** Twitty, Amy/NVR  
**Cc:** Nadia Locke; Criswell, David CIV NAVFAC HQ, BRAC PMO; [Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us); Don Craig; Randy Hollingworth  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Amy – cover sheets of documents sent to Nadia

---

**From:** Nadia Locke [<mailto:nlocke@esciencesinc.com>]  
**Sent:** Monday, August 18, 2014 1:15 PM  
**To:** James Bouquet  
**Cc:** [Amy.Twitty@ch2m.com](mailto:Amy.Twitty@ch2m.com); Criswell, David CIV NAVFAC HQ, BRAC PMO; [Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us); Don Craig; Randy Hollingworth  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Thank you for sending over the documents in the two emails, Jim. We only had the document named DRMO LUC Areas from Deed.pdf. The others documents are new to us. The previous document request we sent Fridays still relevant, as we do not know what documents may exist that we do not have. So, thank you for forwarding the request to Amy prior to me responding. I was in meetings.

Nadia

**Nadia G. Locke, P.E., LEED AP ND**  
Associate



Miami-Dade County CBE, SFWMD SBE

224 SE 9<sup>th</sup> Street  
Fort Lauderdale, FL 33316 [MAP](#)  
954/484-8500 Telephone  
954/484-5146 Fax  
954/937-9678 Cell  
[nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com)

[www.esciencesinc.com](http://www.esciencesinc.com)

Orlando — Fort Lauderdale— Miami — DeLand

---

**From:** James Bouquet [<mailto:jbouquet@keywestcity.com>]  
**Sent:** Monday, August 18, 2014 9:22 AM  
**To:** Nadia Locke  
**Cc:** [Amy.Twitty@ch2m.com](mailto:Amy.Twitty@ch2m.com); Criswell, David CIV NAVFAC HQ, BRAC PMO; [Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us); Don Craig; Randy Hollingworth  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

2 of 2

---

**From:** James Bouquet [<mailto:jbouquet@keywestcity.com>]  
**Sent:** Monday, August 18, 2014 9:20 AM  
**To:** 'Nadia Locke'  
**Cc:** 'Amy.Twitty@CH2M.com'; 'Criswell, David CIV NAVFAC HQ, BRAC PMO'; [Tracie.Vaught@dep.state.fl.us](mailto:Tracie.Vaught@dep.state.fl.us); Don Craig; 'Randy Hollingworth'  
**Subject:** RE: Truman Waterfront Park-Soil Management Plan - Request for Documents

Nadia:

Before forwarding your request to Amy, I just want to confirm you are in receipt of the attached documents.

This is email 1 of 2

Jim

---

**From:** Nadia Locke [<mailto:nlocke@esciencesinc.com>]  
**Sent:** Friday, August 15, 2014 2:34 PM  
**To:** [dcraig@keywestcity.com](mailto:dcraig@keywestcity.com); [jbouquet@keywestcity.com](mailto:jbouquet@keywestcity.com)  
**Cc:** Randy Hollingworth; Justin Freedman; Maria Paituvi  
**Subject:** Truman Waterfront Park-Soil Management Plan - Request for Documents

Good afternoon and thank you for the opportunity to discuss the City's needs and obligations regarding the environmental and land use control issues at the Site. We are looking forward to developing the soil management plan as we understand that it is part of the critical path for the project. We are in receipt of some items based upon what has been provided to us by the City and the information we have downloaded from regulatory databases, but our records are by no means complete. We therefore request the following information be provided to us as soon as practical:

- DRMO/Parcel C-The latest information we have is the Site Rehabilitation Completion Report dated December 2010. Please provide any additional assessment reports or communications with the agencies confirming their acceptance of the recommendations, if they exist. Also, please provide us with the data of the groundwater analysis (site plan and lab reports) as soon as that is received so that we can incorporate that information into the management plan without waiting on the final report if possible.
- Parcel E-We have no documentation associated with the assessment, remediation or regulatory communication on this property. Please provide us with assessment and remediation reports documenting the soil and groundwater quality at Parcels E1, E2 and E3. Also, please provide any regulatory communications relative to these documents or that may be relevant to the project.

Thank you and we look forward to a successful project.

Nadia

**Nadia G. Locke, P.E., LEED AP ND**  
Associate



Miami-Dade County CBE, SFWMD SBE

224 SE 9<sup>th</sup> Street  
Fort Lauderdale, FL 33316 [MAP](#)  
954/484-8500 Telephone  
954/484-5146 Fax  
954/937-9678 Cell  
[nlocke@esciencesinc.com](mailto:nlocke@esciencesinc.com)

[www.esciencesinc.com](http://www.esciencesinc.com)  
Orlando — Fort Lauderdale— Miami — DeLand

---

Total Control Panel

[Login](#)

To: [mpaituvi@esciencesinc.com](mailto:mpaituvi@esciencesinc.com)

[Remove](#) this sender from my allow list

From: [amy.twitty@ch2m.com](mailto:amy.twitty@ch2m.com)

*You received this message because the sender is on your allow list.*

# **APPENDIX B**



0001

N7846-2.1.006

# Department of Environmental Protection

Jeb Bush  
Governor

Twin Towers Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

RECEIVED  
8/30/01

David B. Struhs  
Secretary

August 7, 2001

Q A Record

Mr. Byas Glover  
Code 18410  
Southern Division  
Naval Facilities Engineering Command  
Post Office Box 190010  
North Charleston, South Carolina 29419-9010

RE: Groundwater Monitoring Report, Building 189 Pipeline  
Site, Naval Air Station (NAS) Key West, Key West,  
Florida

Dear Mr. Glover:

I have completed the technical review of the  
Groundwater Monitoring Report and No Further Action Proposal  
for the Building 189 Pipeline Site, NAS Key West dated June  
2001 (received by Electronic Mail June 26, 2001). Based  
upon my review, the enclosed Site Rehabilitation Completion  
Order was signed by Mr. Douglas A. Jones, Chief, Bureau of  
Waste Cleanup. The No Further Action Proposal was  
incorporated by reference in the Site Rehabilitation  
Completion Order.

If I can be of any further assistance with this matter,  
please contact me at (850) 921-9989.

Sincerely,

*Joseph F. Fugitt*

Joseph F. Fugitt, P.G.  
Remedial Project Manager

cc: Robert Courtright, NAS Key West  
Chuck Bryan, Tetra Tech NUS, Aiken, South Carolina

TJB *[Signature]*

JJC *[Signature]*

ESN *[Signature]*

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.



# Department of Environmental Protection

Jeb Bush  
Governor

Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

David B. Struns  
Secretary

August 6, 2001

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

Mr. Byas Glover  
Code 18410  
Southern Division  
Naval Facilities Engineering Command  
Post Office Box 190010  
North Charleston, South Carolina 29419-9010

Subject: Site Rehabilitation Completion Order  
Building 189 Pipeline Site  
Naval Air Station Key West  
Key West, Monroe County

Dear Mr. Glover:

The Bureau of Waste Cleanup has reviewed the Groundwater Monitoring Report and No Further Action Proposal (NFAP) dated June 2001 (received June 26, 2001), submitted for the petroleum product discharge discovered at this site. Documentation submitted with the NFAP confirms that criteria set forth in Rule 62-770.680(1), Florida Administrative Code (F.A.C.), have been met. The NFAP is hereby incorporated by reference in this Site Rehabilitation Completion Order (Order). Therefore, you are released from any further obligation to conduct site rehabilitation at the site for petroleum product contamination, except as set forth below.

- (1) In the event concentrations of petroleum products' contaminants of concern increase above the levels approved in this Order, or if a subsequent discharge of petroleum or petroleum product occurs at the site, the Department of Environmental Protection (Department) may require site rehabilitation to reduce concentrations of petroleum products' contaminants of concern to the levels approved in the NFAP or otherwise allowed by Chapter 62-770, F.A.C.
- (2) Additionally, you are required to properly abandon all monitoring wells, except compliance wells required by Chapter 62-761, F.A.C., for release detection, within 60 days of receipt of this Order. The monitoring wells must be abandoned in accordance with the requirements of Rule 62-532.500(4), F.A.C.

*"Protect, Conserve and Manage Florida's Environment and Natural Resources"*

### Legal Issues

The Department's Order shall become final unless a timely petition for an administrative proceeding (hearing) is filed under Sections 120.569 and 120.57, Florida Statutes (F.S.), within 21 days of receipt of this Order. The procedures for petitioning for a hearing are set forth below.

Persons affected by this Order have the following options:

If you choose to accept the above decision by the Department about the No Further Action Proposal you do not have to do anything. This Order is final and effective as of the date on the top of the first page of this Order.

If you disagree with the decision, you may do one of the following:

- (1) File a petition for administrative hearing with the Department's Office of General Counsel within 21 days of receipt of this Order; or
- (2) File a request for an extension of time to file a petition for hearing with the Department's Office of General Counsel within 21 days of receipt of this Order. Such a request should be made if you wish to meet with the Department in an attempt to informally resolve any disputes without first filing a petition for hearing.

Please be advised that mediation of this decision pursuant to Section 120.573, F.S., is not available.

### How to Request an Extension of Time to File a Petition for Hearing

For good cause shown, pursuant to Rule 62-110.106(4), F.A.C., the Department may grant a request for an extension of time to file a petition for hearing. Such a request must be filed (received) in the Department's Office of General Counsel at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, within 21 days of receipt of this Order. Petitioner, if different from Southern Division of Naval Facilities Engineering Command, shall mail a copy of the request to Southern Division of Naval Facilities Engineering Command at the time of filing. Timely filing a request for an extension of time tolls the time period within which a petition for administrative hearing must be made.

### How to File a Petition for Administrative Hearing

A person whose substantial interests are affected by this Order may petition for an administrative hearing under Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Department's Office of General Counsel at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000,

within 21 days of receipt of this Order. Petitioner, if different from Southern Division of Naval Facilities Engineering Command, shall mail a copy of the petition to Southern Division of Naval Facilities Engineering Command at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

Pursuant to Section 120.54(5)(b)4.a., F.S. (1998, Supp.), and Rule 28-106.201, F.A.C., a petition for administrative hearing shall contain the following information:

- (a) The name, address, and telephone number of each petitioner, the name, address, and telephone number of the petitioner's representative, if any, the site owner's name and address, if different from the petitioner, the FDEP facility number, and the name and address of the facility;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) An explanation of how each petitioner's substantial interests are or will be affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by the petitioner, or a statement that there are no disputed facts;
- (e) A statement of the ultimate facts alleged, including a statement of the specific facts the petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the Department's action or proposed action; and
- (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the Department to take with respect to the Department's action or proposed action.

This Order is final and effective as of the date on the top of the first page of this Order. Timely filing a petition for administrative hearing postpones the date this Order takes effect until the Department issues either a final order pursuant to an administrative hearing or an order responding to supplemental information provided pursuant to meetings with the Department.

#### Judicial Review

Any party to this Order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 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. The notice of appeal must be filed within 30 days after this Order is filed with the clerk of the Department (see below).

Mr. Byas Glover  
August 6, 2001  
Page Four

Questions

Any questions regarding the Department's review of your No Further Action Proposal should be directed to Joseph F. Fugitt, P.G. at (850) 921-9989. Questions regarding legal issues should be referred to the Department's Office of General Counsel at (850) 488-9314. Contact with any of the above does not constitute a petition for administrative hearing or request for an extension of time to file a petition for administrative hearing.

Sincerely,



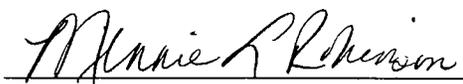
Douglas A. Jones, Chief  
Bureau of Waste Cleanup  
Division of Waste Management

DAJ/jff

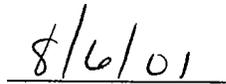
cc: Robert Courtright, NAS Key West, Environmental Department, Post Office Box 9007, Key West, Florida 33040-9007  
Chuck Bryan, Tetra Tech NUS, 900 Trail Ridge Road, Aiken, South Carolina, 29803  
File

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to  
§120.52 Florida Statutes, with the  
designated Department Clerk, receipt  
of which is hereby acknowledged.



Clerk  
(or Deputy Clerk)



Date

Mr. Byas Glover  
Building 189 Pipeline Site NAS Key West

P.G. CERTIFICATION

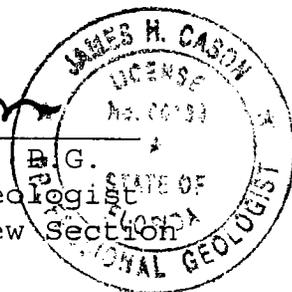
Groundwater Monitoring Report/NFAP for Building 189  
Pipeline Site

I hereby certify that in my professional judgement, the components of this Groundwater Monitoring Report and No Further Action Proposal for the Building 189 Pipeline Site at Naval Air Station Key West, Key West, Florida, satisfy the requirements set forth in Chapter 62-770, F.A.C., and that the geological interpretations in this report provide reasonable assurances of achieving the Assessment objectives stated in Chapter 62-770, F.A.C.

I personally completed this review.

This review was conducted by Joseph F. Fugitt, P.G. working under my supervision.

  
James H. Cason, P.G.  
Professional Geologist  
Technical Review Section



August 7, 2001  
Date

# APPENDIX C

REVISIONS				
LET	DESCRIPTION	PREP'D BY	DATE	APPROVED

MISNER MARINE CONSTRUCTION, INC.  
 "It is hereby certified that the material/equipment shown and marked in this submittal, shop drawing, catalog cut(s), etc., to be incorporated with Contract Number N62467-85-C-0141 is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, is approved for use, and is submitted for Government approval (submitted to Government for record purposes).  
 Authorized Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Signature CQC Rep: *[Signature]* Date: 10-25-84  
*AS-BUILT'S*

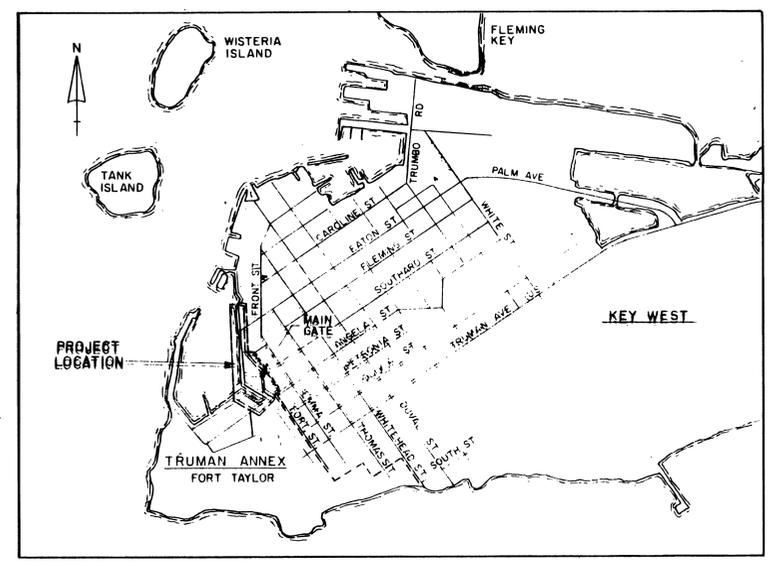
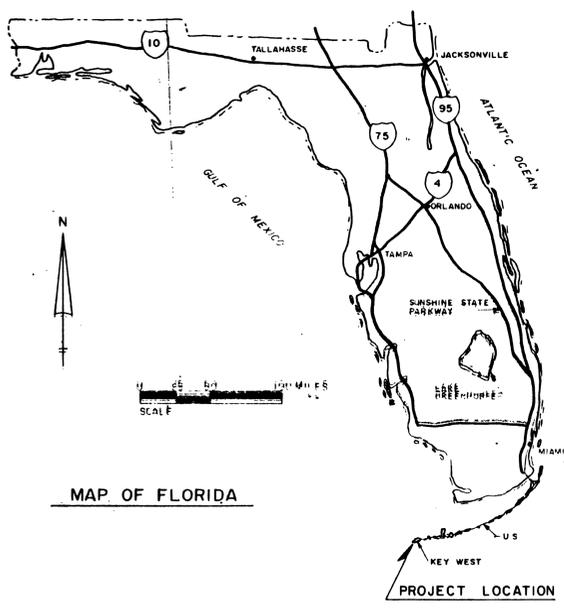
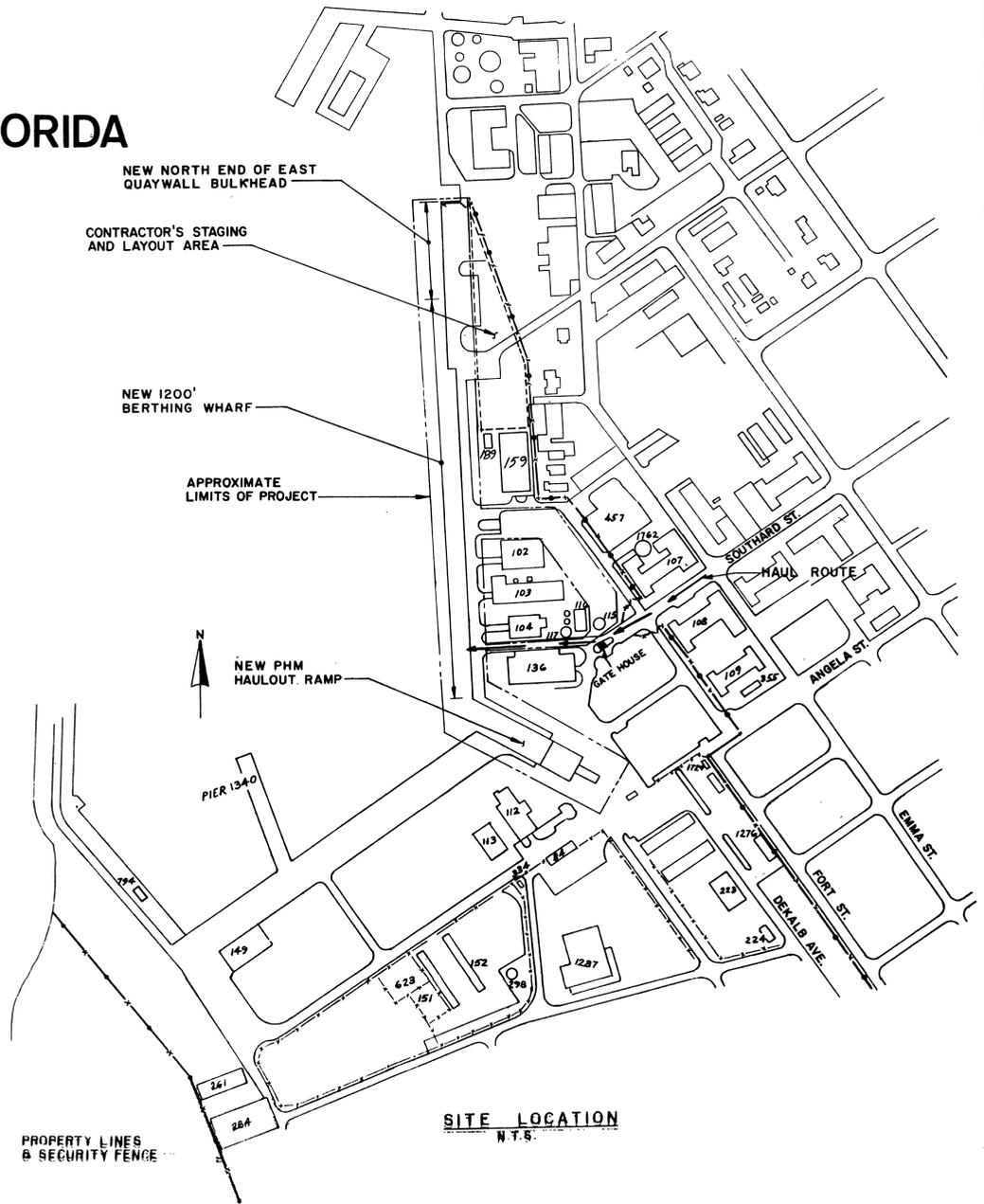
# TRUMAN ANNEX

NAVAL AIR STATION

KEY WEST, FLORIDA

## P H M BERTHING WHARF

CONSTRUCTION CONTRACT NO. N62467-85-C-0141  
 SPECIFICATION NO. 06-85-0141

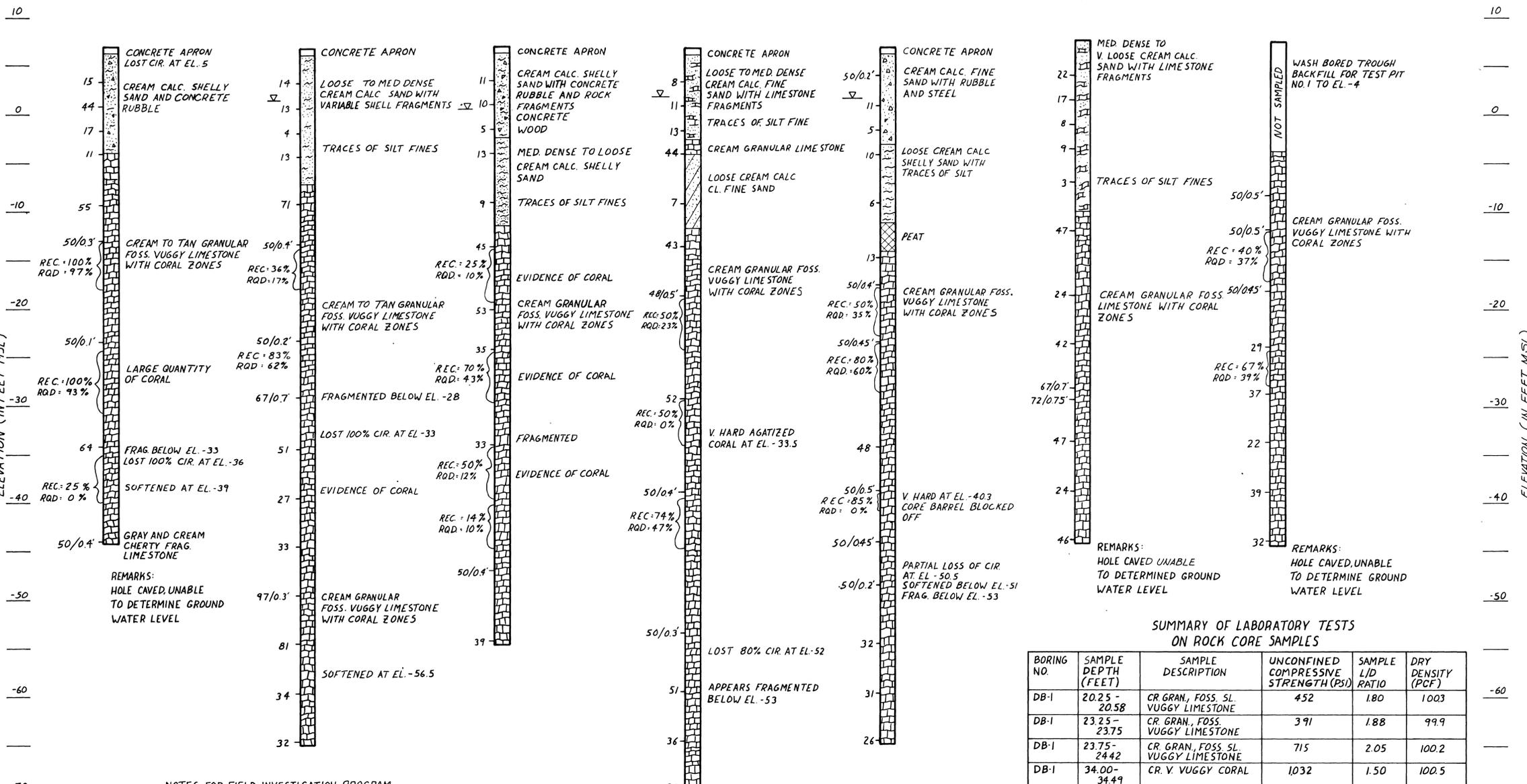


VICINITY MAP  
 SCALE 1/2 0 1 MILE

FOR OFFICIAL USE ONLY		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND SOUTHERN DIVISION CHARLESTON, S. C.	
Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA		NAVAL AIR STATION KEY WEST, FLA.	
SUBMITTED BY: <i>[Signature]</i> DATE: <u>10/25/84</u>		P H M BERTHING WHARF TRUMAN ANNEX SITE LOCATION & VICINITY MAP	
APPROVED BY: <i>[Signature]</i> DATE: <u>10/25/84</u>		SIZE: F	CODE IDENT NO.: 80091
ARCH: <i>[Signature]</i>		SCALE: NOTED	RAVAC DRAWING NO.: 5157631
C-1		CONSTR CONTR NO. N62467-85-C-0141 SPEC-06-85-0141 SHEET 1 OF 2	



BORING NO. DB-1 DB-2 DB-3 DB-4 DB-5 DB-6 DB-7  
 @ "B" STATION 118+70 121+62 124+10 126+80 129+30 114+12 112+09  
 OFFSET 5' LT. 1' LT. 5' LT. 5' LT. 25' LT. 58' RT. 5' RT.



NOTES FOR FIELD INVESTIGATION PROGRAM CAN BE FOUND ON SHEET C-22

REVISIONS			
LET	DESCRIPTION	PREP BY	DATE

**LEGEND FOR BORING LOGS**

	CONCRETE		ASPHALT AND BASE
	LIMESTONE		SAND (SW-SM TO SM)
	SANDY SILT (ML)		CLAYEY SAND (SM-SC TO SC)
	ORGANIC MATERIAL (Pt)		SAND WITH LIMESTONE FRAGMENTS (SM-SM TO SM WITH LIMESTONE)
	SHELL		SAND WITH RUBBLE (SM-SM TO SM WITH RUBBLE)
	LIMESTONE AND SHELL		UNIFIED SOIL CLASSIFICATION (TYPICAL)

**ABBREVIATIONS**

L.MRK.	LIMEROCK	TR.	TRACES
ASPH.	ASPHALT	CR.	CREAM
FOSS.	FOSSILIFEROUS	GRAN.	GRANULAR
CL.	CLAYEY	L.S.	LIMESTONE
CIR.	CIRCULATION		
FRAG.	FRAGMENTED		
CALC.	CALCAREOUS		
EL.	ELEVATION		
V.	VERY		
MED.	MEDIUM		
BR.	BROWN		
REC.	RECOVERY		
RQD.	ROCK QUALITY DESIGNATION		
S.P.T.	STANDARD PENETRATION TEST		
SL.	SLIGHTLY		

**LOCATION OF GROUND WATER IN TEST HOLE**

S.P.T. BLOWCOUNTS FOR 12 INCHES OF PENETRATION → 36

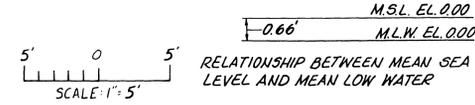
S.P.T. BLOWCOUNTS FOR PENETRATION INTERVAL INDICATED → 64/07'

INTERVAL OF 4" DIAMETER ROCK CORING →

**SUMMARY OF LABORATORY TESTS ON ROCK CORE SAMPLES**

BORING NO.	SAMPLE DEPTH (FEET)	SAMPLE DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH (PSI)	SAMPLE L/D RATIO	DRY DENSITY (PCF)
DB-1	20.25 - 20.58	CR GRAN, FOSS SL VUGGY LIMESTONE	452	1.80	100.3
DB-1	23.25 - 23.75	CR GRAN, FOSS VUGGY LIMESTONE	391	1.88	99.9
DB-1	23.75 - 24.42	CR GRAN, FOSS SL VUGGY LIMESTONE	715	2.05	100.2
DB-1	34.00 - 34.49	CR V. VUGGY CORAL	1032	1.50	100.5
DB-1	34.64 - 35.13	CR GRAN, FOSS VUGGY LIMESTONE, TR. OF CORAL	641	1.53	111.5
DB-2	30.15 - 30.85	CR SL VUGGY CORAL	1333	2.12	120.5
DB-3	32.00 - 32.45	CR GRAN, FOSS V VUGGY LIMESTONE	397	1.46	90.8
DB-4	26.65 - 27.05	CR GRAN, V SL VUGGY LIMESTONE	502	1.32	100.4
DB-4	46.00 - 47.15	CR GRAN, FOSS V VUGGY LIMESTONE	271	1.70	99.5
DB-4	47.15 - 47.56	CR GRAN, FOSS V VUGGY LIMESTONE	151	1.40	103.1
DB-5	32.65 - 33.09	CR SL VUGGY CORAL	383	1.39	102.1
DB-7	21.00 - 21.45	CR GRAN, FOSS V SL VUGGY LIMESTONE	668	1.37	103.1
SB-2	17.85 - 18.42	CR GRAN, FOSS	283	1.78	94.4

DRY DENSITIES WERE OBTAINED BY CALCULATING THE GROSS VOLUME OF THE CORE BASED ON THE LENGTH OF THE CORE AND AVERAGE OUTSIDE DIAMETER.

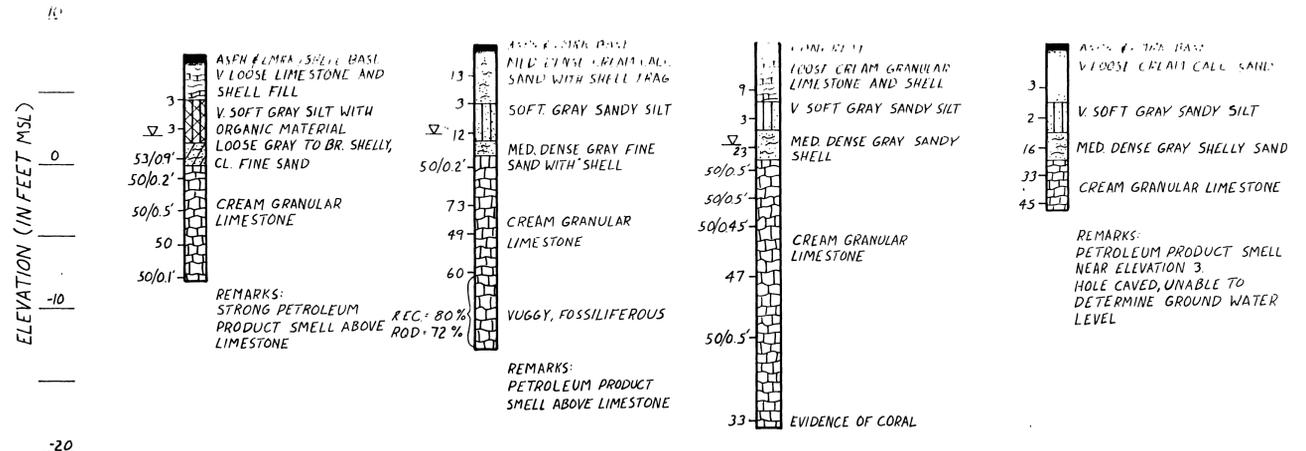


**SUMMARY OF PULLOUT TEST RESULTS**

TEST LOCATION	DEPTH TO BOTTOM OF PLUG (FEET)	TEST PLUG LENGTH (FEET)	FAILURE LOAD (TONS)
DB-2	25.0	3.5	27.5
DB-3	25.0	2.9	56.0
DB-4	37.0	3.3	60.0
DB-5	34.0	3.0	70.0

NOTE: NO TEST PLUGS WERE RECOVERED. THE 4" DIAMETER CORE BARREL USED CORES A NOMINAL 6" DIAMETER HOLE. TEST PLUG DIAMETERS ≥ 6".

BORING NO. SB-1 SB-2 SB-3 SB-4  
 @ "B" STATION 0+36 0+96 2+18 1+07  
 OFFSET 9' RT 23' RT 13' RT 9' RT



**BORING LOGS**  
SCALE: 1"=5'-0" VERTICAL

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DEPARTMENT OF THE NAVY SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND CHARLESTON S.C.

NAVAL AIR STATION KEY WEST, FLA.

PHM BERTHING WHARF TRUMAN ANNEX BORING LOGS

5157653

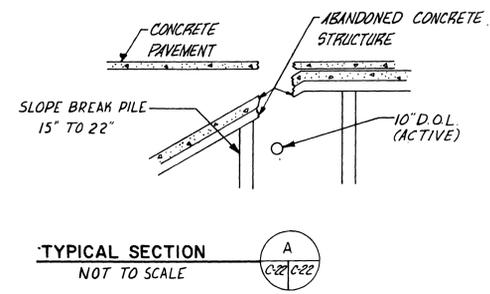
CONSTR CONTR NO: N62467-85-C-0141

SPEC: 06-85-0141 SHEET: 23 OF

APPROVED: [Signature] DATE: 1/11/68

OFFICER IN CHARGE: [Signature] DATE: 1/11/68

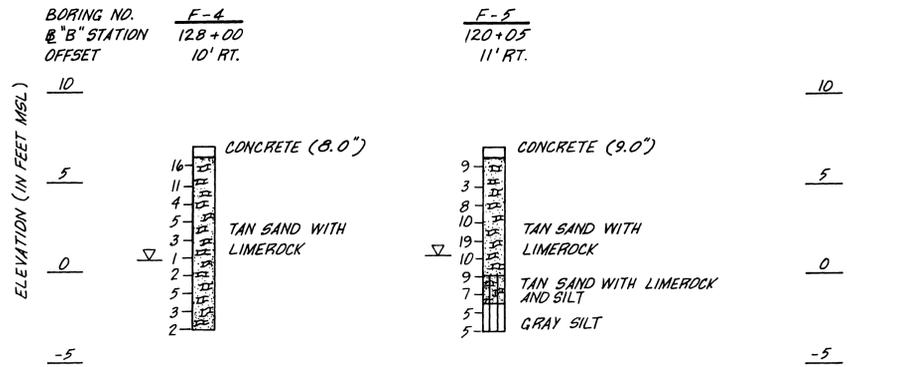
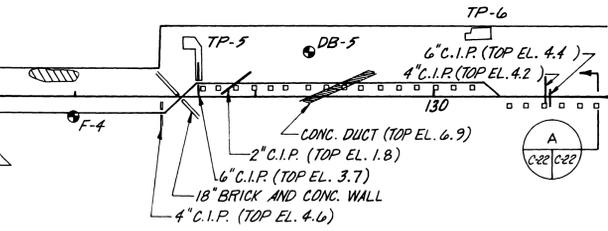
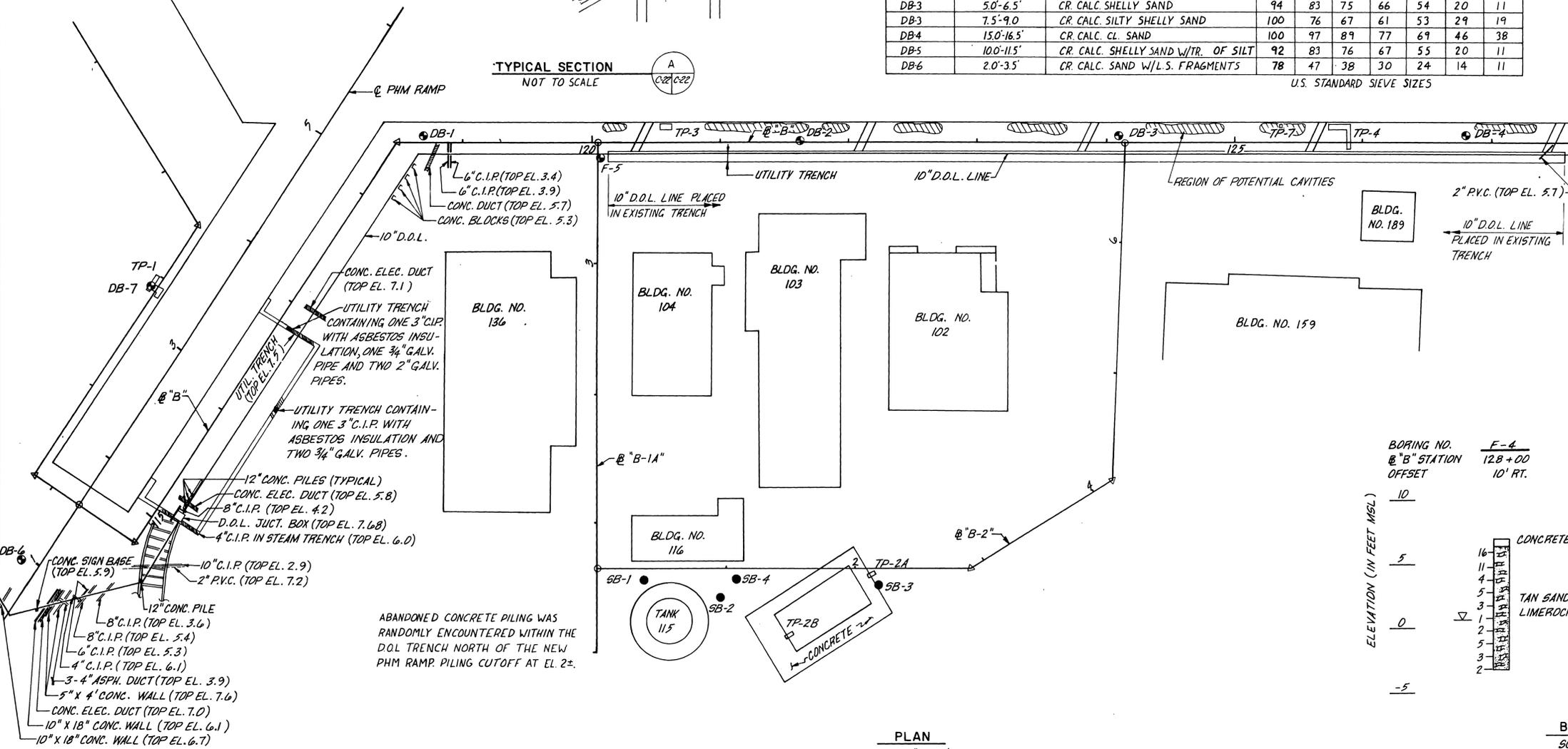
ARCH & ENGR SEAL: [Signature] DATE: 1/11/68



BORING NO.	SAMPLE DEPTH	DESCRIPTION	PERCENT FINER BY WEIGHT						
			3/4"	NO. 4	NO. 10	NO. 20	NO. 40	NO. 100	NO. 200
SB-1	4.0'-5.5'	GRAY SANDY SILT	100	99	97	89	81	63	53
SB-3	6.0'-7.5'	GRAY SILTY, SHELLY SAND	100	99	95	89	77	31	22
SB-3	2.0'-3.5'	CR. GRAN. L.S. AND SHELL	93	82	74	62	40	21	19
DB-1	2.0'-3.5'	CR. CALC. SILTY SHELLY SAND	100	93	87	82	73	39	22
DB-2	7.5'-9.0'	CR. CALC. SILTY FINE SAND W/SHELL	91	76	69	63	54	28	18
DB-3	5.0'-6.5'	CR. CALC. SHELLY SAND	94	83	75	66	54	20	11
DB-3	7.5'-9.0'	CR. CALC. SILTY SHELLY SAND	100	76	67	61	53	29	19
DB-4	15.0'-16.5'	CR. CALC. CL. SAND	100	97	89	77	69	46	38
DB-5	10.0'-11.5'	CR. CALC. SHELLY SAND W/TR. OF SILT	92	83	76	67	55	20	11
DB-6	2.0'-3.5'	CR. CALC. SAND W/L.S. FRAGMENTS	78	47	38	30	24	14	11

U.S. STANDARD SIEVE SIZES

DESCRIPTION	PREP BY	DATE	APPROVED

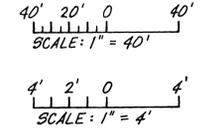


PLAN  
SCALE: 1" = 40'

BORING LOGS  
SCALE: 1" = 4' VERT.

- NOTES**
- "F" BORINGS WERE DRILLED BY FLORIDA TESTING AND ENGINEERING CO. OF FT. LAUDERDALE, FLORIDA DURING OCTOBER 1983. ALL OTHER BORINGS WERE DRILLED BY DRIGGERS ENGINEERING SERVICES, INC. OF CLEARWATER, FLORIDA DURING JULY AND AUGUST OF 1985.
  - BORINGS WERE STANDARD PENETRATION TEST (S.P.T.) BORINGS IN GENERAL ACCORDANCE WITH ASTM D 1586. SPOON SAMPLER = 1 3/8" INSIDE DIA., 2" OUTSIDE DIA. HAMMER WEIGHT = 140 POUNDS. AVERAGE HAMMER DROP = 30".
  - NUMBERS TO LEFT OF BORING LOGS INDICATE S.P.T. BLOW COUNT FOR 12 INCH (UNLESS NOTED OTHERWISE) SPLIT SPOON PENETRATION.
  - FOUR INCH DIA. ROCK CORING WAS PERFORMED AT SELECTED LOCATIONS IN DB BORINGS. RECOVERY (CUMULATIVE LENGTH OF MATERIAL RECOVERED, EXPRESSED AS A PERCENT OF TOTAL CORE LENGTH) AND ROCK QUALITY DESIGNATION (CUMULATIVE LENGTH OF RECOVERED INTACT PIECES 4 INCHES AND LONGER, EXPRESSED AS A PERCENT OF TOTAL CORE LENGTH) FOR EACH CORE IS INDICATED ON THE CORRESPONDING BORING. THE ABBREVIATIONS "REC" AND "RQD" ARE USED.
  - THE BORING LOGS SHOWN ARE FOR THE CONTRACTOR'S GENERAL INFORMATION ONLY AND REPRESENT SUBSURFACE CONDITIONS ENCOUNTERED WITHIN THE TEST HOLE AT THE TIME OF TESTING.
  - LABORATORY TESTING ON SELECTED SAMPLES INCLUDED GRAIN SIZE ANALYSES, UNCONFINED COMPRESSION TEST, AND ROCK CORE DENSITY. RESULTS ARE PRESENTED IN TABULAR FORM ON THIS SHEET AND ON SHEET C-23.
  - PULLOUT TESTS WERE CONDUCTED AT SELECTED LOCATIONS IN DB BORINGS TO EVALUATE ROCK ULTIMATE FRICTIONAL STRENGTH. THIS WAS ACCOMPLISHED BY INSTALLING A REINFORCED GROUT PLUG AT A CHOSEN SMALL DEPTH INTERVAL IN A BOREHOLE AND JACKING THE PLUG UNTIL FAILURE OCCURRED. PULLOUT TEST RESULTS ARE PRESENTED IN TABULAR FORM ON SHEET C-23.
  - TEST PITS WERE EXCAVATED BY WILLIAM G STEVENS, INC. OF KEY WEST FLORIDA DURING JULY AND AUGUST OF 1985.
  - THE TEST PIT DETAILS SHOWN HEREIN ARE PROVIDED FOR THE CONTRACTOR'S GENERAL INFORMATION. THE CONTRACTOR SHALL ANTICIPATE THAT ACTUAL CONDITIONS MAY VARY BETWEEN AND ADJACENT TO TEST PIT LOCATIONS.
  - ALL TEST PITS EXCEPT TP-7 WERE BACKFILLED AND COMPACTED, AND ALL TEST PITS EXCEPT TP-2A, 2B, AND 7 RECEIVED A 6 TO 8 INCH CONCRETE SURFACE PATCH WITH WIRE MESH REINFORCEMENT.
  - IN THESE AREAS INDICATED, THE CONCRETE APRON PAVEMENT WAS OBSERVED TO EXHIBIT SEVERE CRACKING, AND SETTLEMENTS OF UP TO 16" WERE MEASURED AT SEVERAL LOCATIONS. TEST PIT NO. 7 SHOWED THAT CAVITIES DO EXIST IN SOME AREAS ADJACENT TO THE EXISTING BULKHEAD.
  - LOGS FOR SB AND DB BORINGS ARE SHOWN ON SHEET C-23.
  - THE 10" D.O.L. LINE SHOWN ON THE ABOVE PLAN WAS INSTALLED UNDER SEPARATE CONTRACT. THE FEATURES SHOWN ON THIS DRAWING WERE NOTED BY A REPRESENTATIVE OF GREINER ENGINEERING SCIENCES, INC. IN MARCH 1985 AFTER TRENCHING FOR THIS LINE WAS COMPLETED. THIS INFORMATION IS PROVIDED FOR THE CONTRACTOR'S GENERAL INFORMATION.

- LEGEND**
- SB SHALLOW (10' TO 30') STANDARD PENETRATION TEST BORING.
  - ⊕ DB DEEP (50' TO 75') STANDARD PENETRATION TEST BORING.
  - TP TEST PIT.
  - ▽ INDICATES LOCATION OF GROUND WATER TABLE.
  - ▨ REGION OF POTENTIAL CAVITIES - SEE NOTE 11.

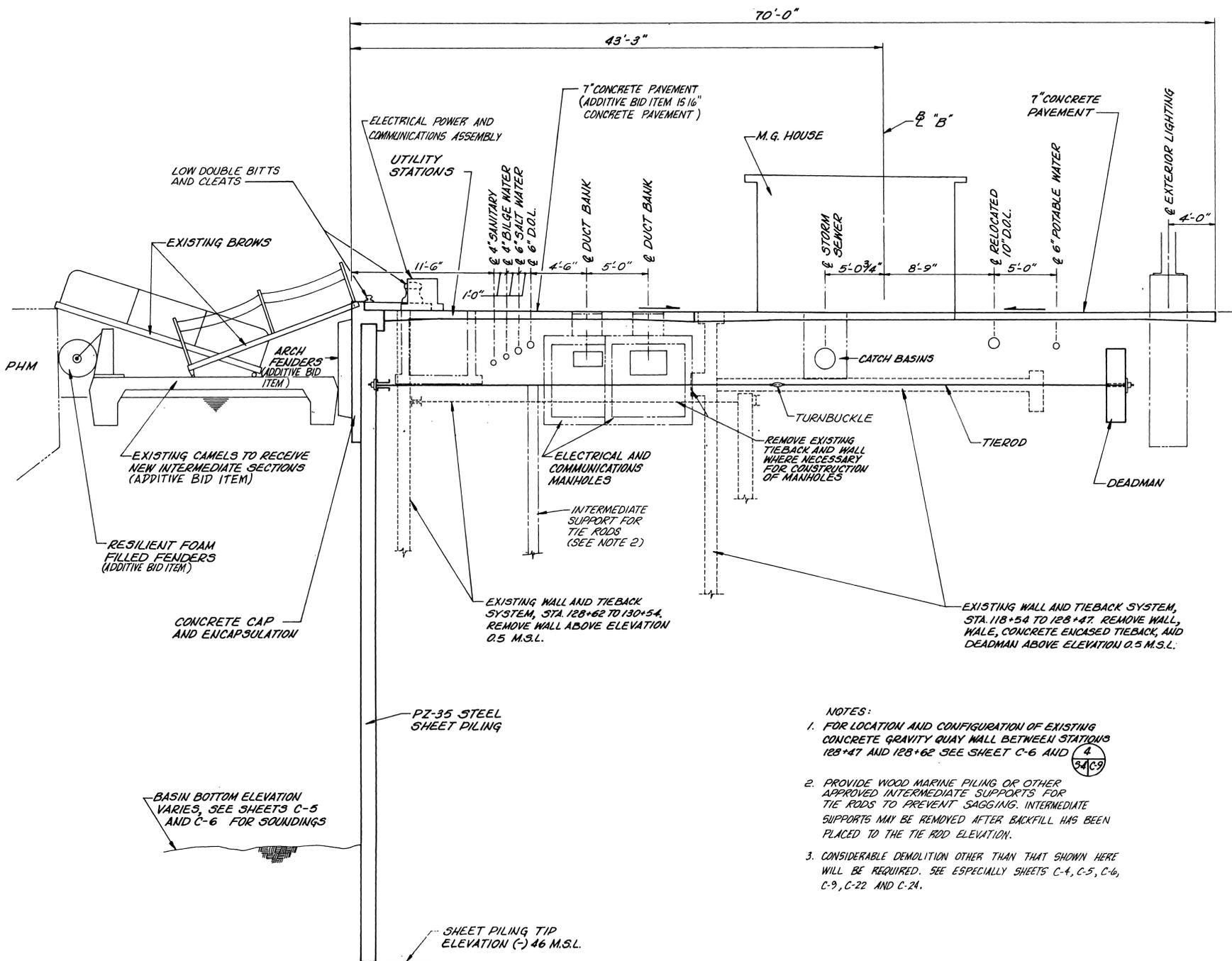


M.S.L. EL. 0.00  
0.66' M.L.W. EL. 0.00  
RELATIONSHIP BETWEEN MEAN SEA LEVEL AND MEAN LOW WATER

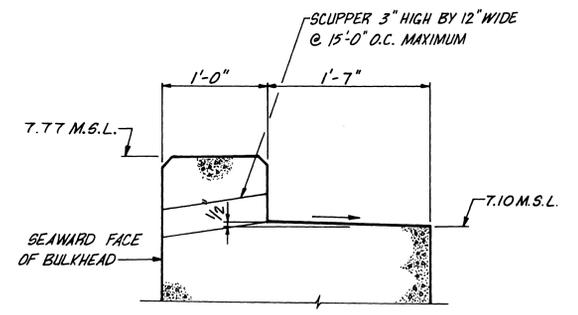
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Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ORGAN. EVALUATED BY ZICHLIN, WALKER SUPV. WALKER CHENG M. MILITELLO SUBMITTED BY S. MICHALLO EUP 01/20/86 FIG. E.P. Sittler	SOUTHERN DIVISION CHARLESTON S.C.
APPROVED: [Signature] DATE: 6/12/86	NAVAL AIR STATION KEY WEST, FLA.
OFFICER IN CHARGE: [Signature]	PHM BERTHING WHARF TRUMAN ANNEX
APPROVED: [Signature] DATE: 7/16/86	BORING LOCATIONS AND TEST PITS
ARCH & ENGR SEAL	NAVAC DRAWING NO. 5157652
	CONSTR CONTR NO. N62467-85-C-0141
	SCALE AS NOTED SPEC 06-85-0141 SHEET 22 OF

REVISIONS				
LET	DESCRIPTION	PREP'D BY	DATE	APPROVED



M.S.L. EL. 0.00  
 -0.66' M.L.W. EL. 0.00  
 RELATIONSHIP BETWEEN MEAN SEA LEVEL AND MEAN LOW WATER.



APPLIES FOR NEW BERTHING AREA @ "B" STA. 118+54 TO 133+66.

ENCAPSULATION GRADING DETAIL  
 SCALE: 1/2" = 1'-0" (1/8")  
 C-13, C-14, WC-4

FOR TIE RODS BETWEEN @ PHM RAMP STATIONS 5+16.28 AND 5+61.56 AND WHARF AREA SOUTH OF STA. 130+64.55

SYSTEM	ROD DIA. (IN.)	UPSET DIA. (IN.)	TURNBUCKLE	ROD MATERIAL
1	3"	3 1/4"	3 1/4"	A-36
2	3 1/4"		3 1/4"	A-36
3	2 1/2"	3 1/4"	3 1/4"	A-588
4	3 1/4"		3 1/4"	A-588

- NOTES:
- THE CONTRACTOR SHALL HAVE THE OPTION TO SELECT ONE OF THE FOUR TIE ROD SYSTEMS LISTED ABOVE FOR THE APPROPRIATE AREA. THE SELECTED SYSTEM SHALL NOT BE CHANGED DURING THE COURSE OF THE WORK.
  - ALL CHANNELS USED FOR WALES BEHIND PZ35 SHEETING SHALL BE A-572, CP. 50.
  - THE TIE RODS PROVIDED BETWEEN @ PHM RAMP STATIONS 5+16.28 AND 5+31.38 SHALL SLOPE FROM EL. 1.25 M.S.L. AT THE WALE TO EL. 0.90 AT THE DEADMAN.
  - THE TIE RODS PROVIDED ALONG THE WHARF WALLS BETWEEN @ "B" STATIONS 118+55.77 AND 120+16.3 SHALL SLOPE FROM EL. 1.25 M.S.L. AT THE WALE TO EL. (-) 0.10 AT THE DEADMAN.
  - TIE RODS SHALL HAVE 1.00" UPSET DIA. AT THE WALE AND SHALL BE 3.00" DIA. AT THE DEADMAN.

- NOTES:
- FOR LOCATION AND CONFIGURATION OF EXISTING CONCRETE GRAVITY QUAY WALL BETWEEN STATIONS 128+47 AND 128+62 SEE SHEET C-6 AND (4) (C-9)
  - PROVIDE WOOD MARINE PILING OR OTHER APPROVED INTERMEDIATE SUPPORTS FOR THE RODS TO PREVENT SAGGING. INTERMEDIATE SUPPORTS MAY BE REMOVED AFTER BACKFILL HAS BEEN PLACED TO THE TIE ROD ELEVATION.
  - CONSIDERABLE DEMOLITION OTHER THAN THAT SHOWN HERE WILL BE REQUIRED. SEE ESPECIALLY SHEETS C-4, C-5, C-6, C-9, C-22 AND C-24.

BASIN BOTTOM ELEVATION VARIES, SEE SHEETS C-5 AND C-6 FOR SOUNDINGS

PZ-35 STEEL SHEET PILING

SHEET PILING TIP ELEVATION (-) 46 M.S.L.

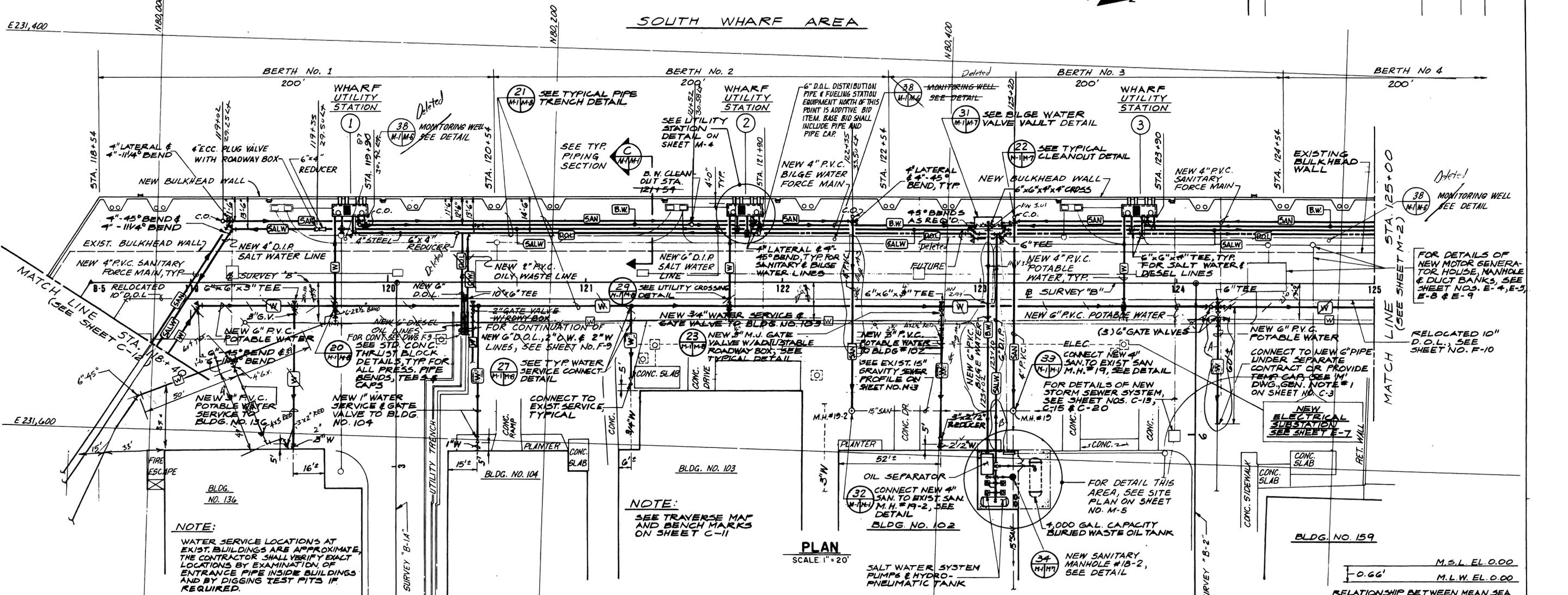
TYPICAL CROSS SECTION (A) (1/8")  
 SCALE: 1/4" = 1'-0" (5-1, 5-2)

12' 6' 0' 1' 2'  
 SCALE: 1/2" = 1'-0"  
 12' 0' 2' 4'  
 SCALE: 1/4" = 1'-0"

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Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND SOUTHERN DIVISION CHARLESTON, S.C.
DESIGN: EVANS, VONDERBERG, WALKER SUPERVISOR: WALKER CH. ENGR. MITTELLO SUBMITTED BY: S. M. B. DATE: 6/2/80 FOR REVIEW BY: E.V.P. DATE: 6/2/80 DC: U. S. SIGNATURE: [Signature]	NAVAL AIR STATION KEY WEST, FLA. PHM BERTHING WHARF TRUMAN ANNEX SECTIONS AND DETAILS
APPROVED: [Signature] DATE: 6/2/80 OFFICER IN CHARGE: [Signature] DATE: 6/2/80 APPROVED: [Signature] DATE: 6/2/80 SUPERVISOR: [Signature] DATE: 6/2/80	NAVFAC DRAWING NO. 5157690 CONSTR. CONTR. NO. N62467-85-C-0141 SCALE AS NOTED SPEC. 06-85-0141 SHEET 62 OF 62



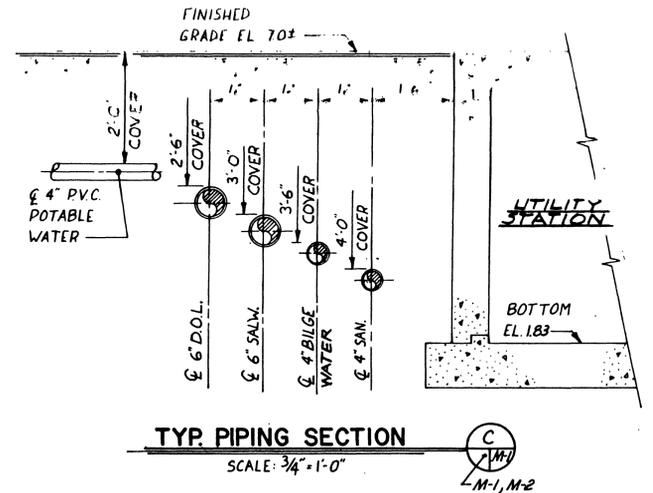


**NOTE:**  
WATER SERVICE LOCATIONS AT EXIST. BUILDINGS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY EXACT LOCATIONS BY EXAMINATION OF ENTRANCE PIPE INSIDE BUILDINGS AND BY DIGGING TEST PITS IF REQUIRED.

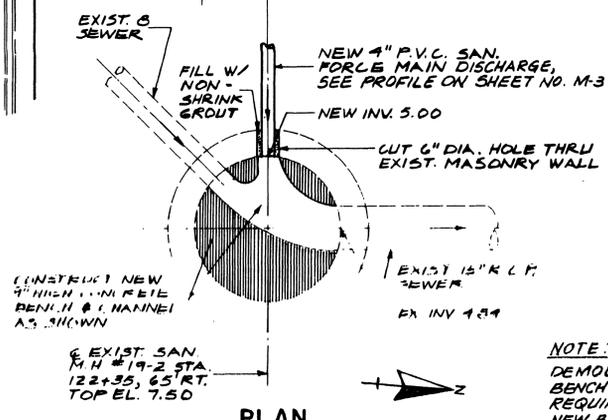
**NOTE:**  
SEE TRANSVERSE MAP AND BENCH MARKS ON SHEET C-11

**PLAN**  
SCALE: 1"=20'

- NOTES:**
- FOR LEGEND, SEE SHEET C-2
  - FOR GENERAL NOTES, SEE SHEET C-3
  - THE ELECTRICAL DISTRIBUTION IS SHOWN SCHEMATICALLY ON THIS SHEET AND SHEET M-2. FOR EXACT LOCATIONS AND SIZES, SEE SHIS. E-4 AND E-5.
  - UNLESS OTHERWISE INDICATED, ALL EXISTING STRUCTURES OR UTILITIES ON THIS SHEET WHICH INTERFERE WITH NEW CONSTRUCTION SHALL BE DEMOLISHED AND REMOVED, TO THE EXTENT NECESSARY FOR NEW CONSTRUCTION. THE CONTRACTOR SHALL ALSO DEMOLISH AND REMOVE ALL STRUCTURES AND UTILITIES INDICATED ON OTHER SHEETS.
  - EXISTING PIPE OBSTRUCTIONS AND ABANDONED UTILITIES SHOWN ARE FROM THE BEST INFORMATION AVAILABLE, BUT NOT GUARANTEED. SHOULD THE CONTRACTOR ENCOUNTER OBSTRUCTIONS AND/OR UTILITIES NOT INDICATED, THE CONTRACTING OFFICER SHALL BE NOTIFIED FOR DISPOSITION.
  - ALL ELEVATIONS SHOWN ARE MEAN SEA LEVEL (M.S.L.).

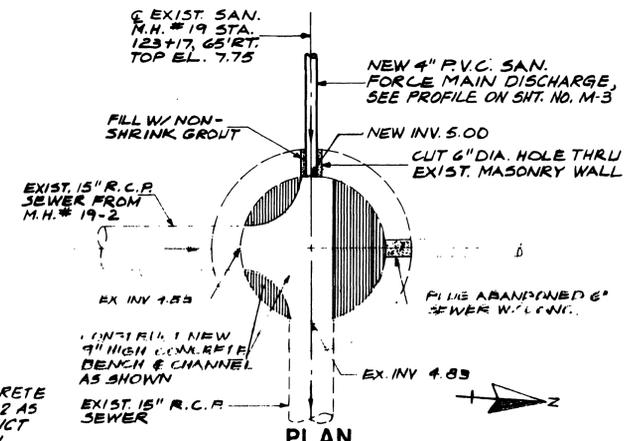


**TYP. PIPING SECTION**  
SCALE: 3/4"=1'-0"

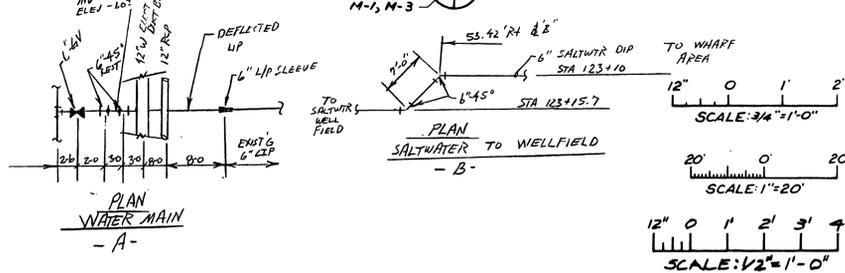


**PLAN**  
EXIST. SAN. M.H. #19-2  
SCALE: 1/2"=1'-0"

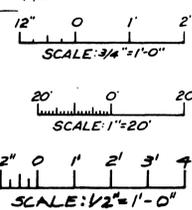
**NOTE:**  
DEMOLISH EXIST. CONCRETE BENCH IN M.H. #19 & 19-2 AS REQUIRED TO CONSTRUCT NEW BENCH & CHANNEL.



**PLAN**  
EXIST. SAN. M.H. #19  
SCALE: 1/2"=1'-0"



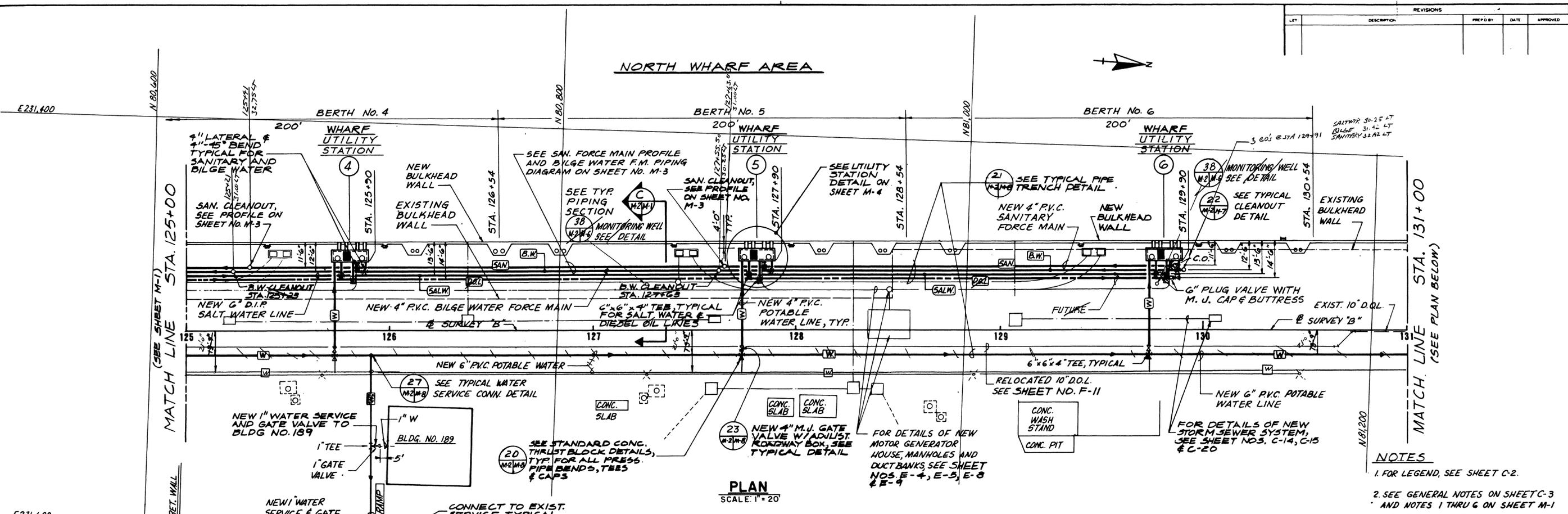
**PLAN**  
SALT WATER MAIN - B



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Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA	DEPARTMENT OF THE NAVY NAVAL AIR STATION KEY WEST, FLA.
DESIGNED BY: DAVIS CHECKED BY: WALKER SUBMITTED BY: [Signature] DATE: 1/10/86 SCALE: AS NOTED	NAVY FAC. ENGINEERING COMMAND SOUTHERN DIVISION CHARLES ON 3.3 KEY WEST, FLA.
APPROVED: [Signature] DATE: 1/14/86 OFFICER IN CHARGE: [Signature] DATE: 1/14/86 FOR COMMANDER NAVSTA	PHM BERTHING WHARF TRUMAN ANNEX UTILITY PLAN - SOUTH WHARF
CODE: 80091 DATE: 1/14/86	NAVSTA DRAWING NO: 5157655 CONTRACT NO: N62467-85-0-0141 SPEC: 06-85-0141

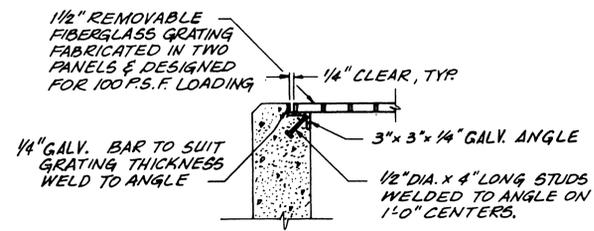
REV.	DESCRIPTION	PREP'D BY	DATE	APPROVED



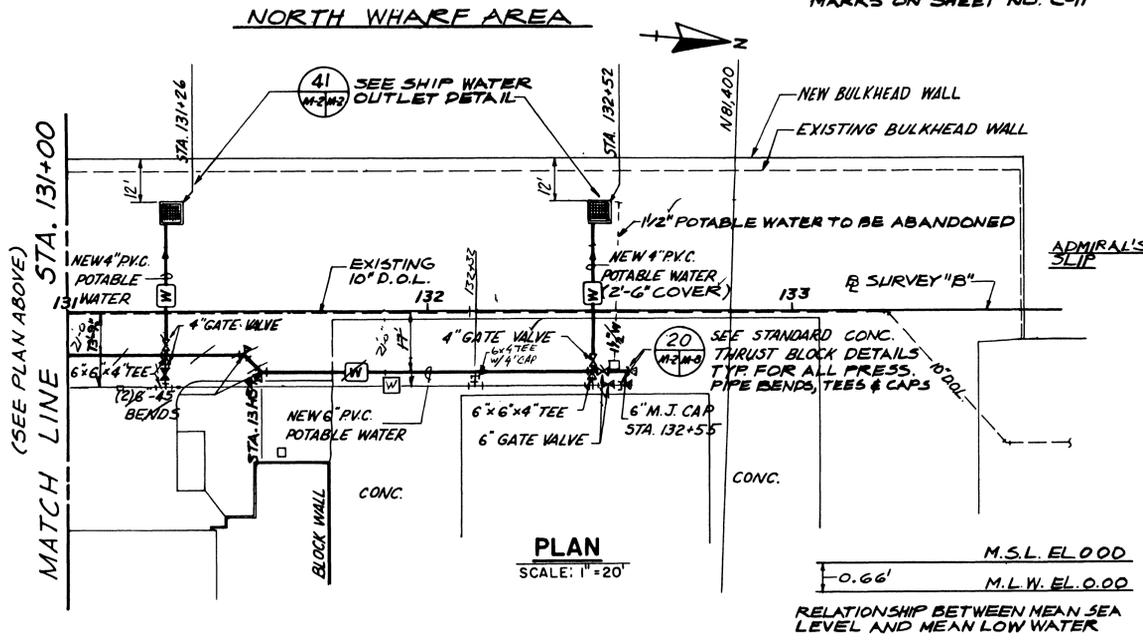
**PLAN**  
SCALE: 1" = 20'

- NOTES**
- FOR LEGEND, SEE SHEET C-2.
  - SEE GENERAL NOTES ON SHEET C-3 AND NOTES 1 THRU 6 ON SHEET M-1
  - SEE TRAVERSE MAP AND BENCH MARKS ON SHEET NO. C-11

**NOTE:**  
WATER SERVICE LOCATIONS AT EXIST. BUILDINGS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY EXACT LOCATIONS BY EXAMINATION OF ENTRANCE PIPE INSIDE BUILDINGS AND BY DIGGING TEST PITS IF REQUIRED.

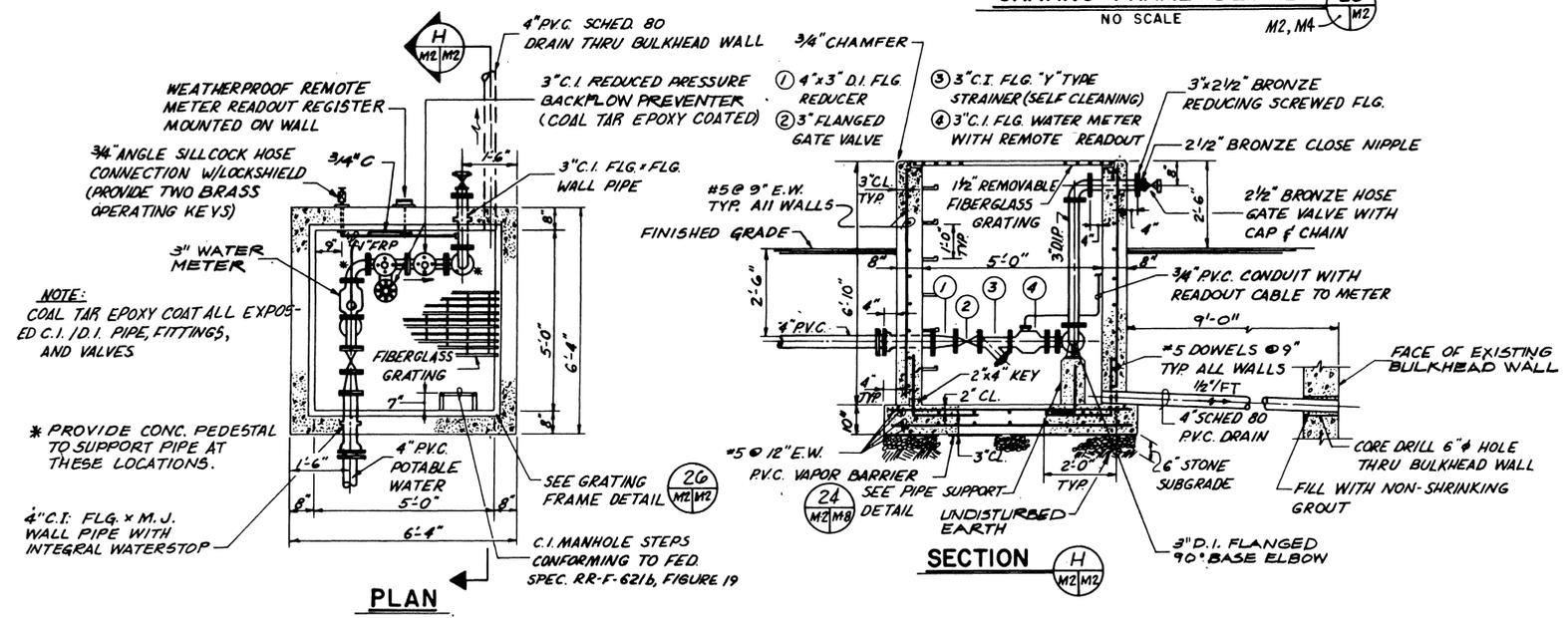


**GRATING FRAME DETAIL**  
NO SCALE M2, M4 M2



**PLAN**  
SCALE: 1" = 20'

M.S.L. FLOOD  
-0.66'  
M.L.W. EL. 0.00  
RELATIONSHIP BETWEEN MEAN SEA LEVEL AND MEAN LOW WATER



**SECTION**  
H M2/M2

**SHIP WATER OUTLET DETAIL**  
(2 REQ'D - STA. 131+32 & 132+51)  
SCALE: 1/2" = 1'-0"

**NOTE:**  
COAL TAR EPOXY COAT ALL EXPOSED C.I. J.O.I. PIPE, FITTINGS, AND VALVES

\* PROVIDE CONC. PEDESTAL TO SUPPORT PIPE AT THESE LOCATIONS.

4" C.I. FLG. x M.J. WALL PIPE WITH INTEGRAL WATERSTOP

**PLAN**

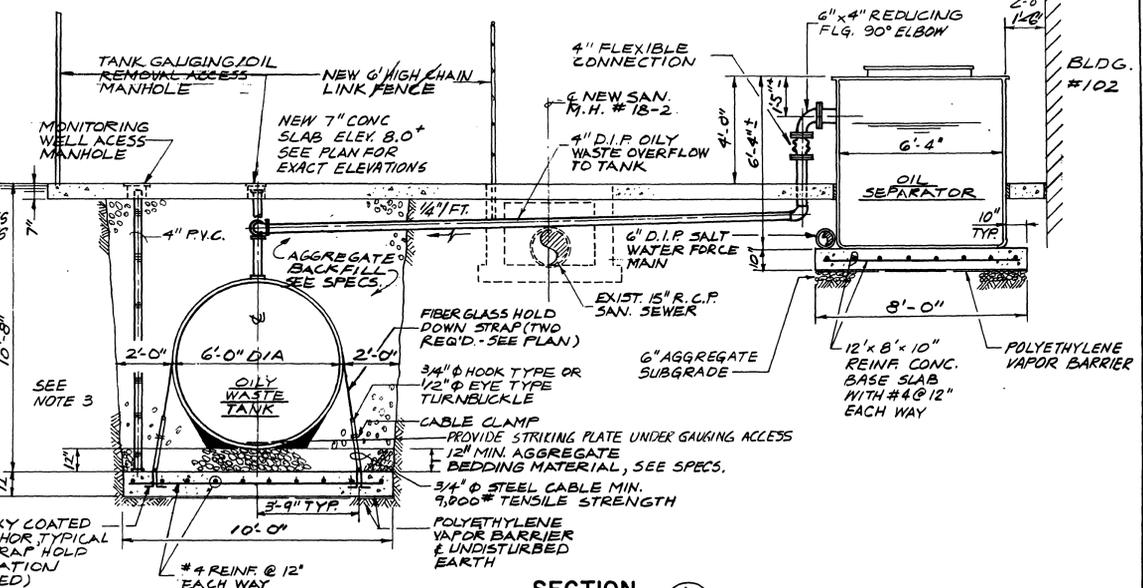
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Grainer Engineering Sciences, Inc.		DEPARTMENT OF THE NAVY	
SOUTHERN DIVISION		CHARLESTON S.C.	
NAVAL AIR STATION		KEY WEST, FLA.	
PHM BERTHING WHARF		TRUMAN ANNEX	
UTILITY PLAN - NORTH WHARF			
APPROVED	DATE	SIZE	CODE IDENT NO.
		F	80091
OFFICER IN CHARGE	DATE	SCALE	NAVY DRAWING NO.
		SCALE AS NOTED	5157656
CONTRACTOR NO. N62467-85-C-0141		SPEC 06-85-0141	
SHEET 26 OF			

REV	DESCRIPTION	PREP BY	DATE	APPROVED

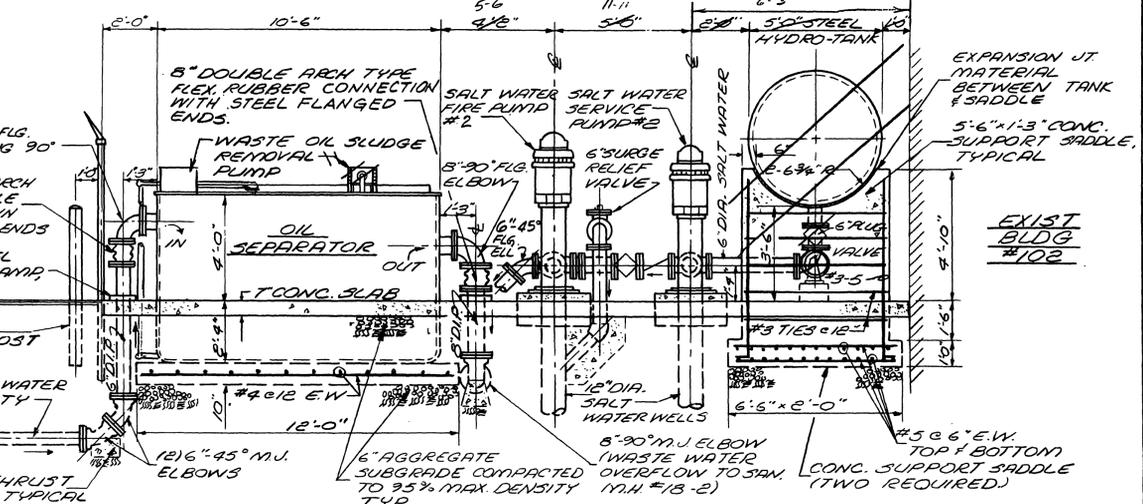
- NOTES:**
- FOR LEGEND, SEE SHEET NO. C-2.
  - FOR GENERAL NOTES, SEE SHEET NO. C-3.
  - SHADED AREAS SHOWN ON SECTION (A) THIS SHEET INDICATE WHERE AGGREGATE BACKFILL WILL NOT FLOW AND COMPACT UNDER TANK. GRAVEL MUST BE WORKED INTO VOIDS FOR APPROX. THE FIRST 12 INCH LAYER OF FILL ABOVE THE BASE LAYER TO INSURE PROPER BEDDING OF THIS CRITICAL AREA.
  - ALL EXPOSED FERROUS METAL PIPING SHALL BE COATED WITH COAL TAR EPOXY AND ALL UNDERGROUND FERROUS PIPING SHALL BE BITUMINOUS COATED, D.I. PIPE SHALL BE CEMENT LINED.
  - ALL ELEVATIONS SHOWN ARE MEAN SEA LEVEL (M.S.L.).
  - PROVIDE TYPE (A) THICKENED EDGE JOINT AT ALL EDGES OF CONCRETE SLAB AND PROVIDE 3 TYPE (A) JOINTS AT EQUAL SPACINGS IN BOTH DIRECTIONS ACROSS SLAB.
  - PLACE 1/2" EXPANSION JOINT MATERIAL AND SEALANT AROUND ALL PROTRUSIONS THRU THE CONCRETE SLAB.

- (43) SEE DETAIL OF TUBING CONNECTION @ 6" CROSS
- (35) 12" DIA. x 50' DEEP SALT WATER WELL, TYPICAL @ EACH PUMP SEE DETAIL (4 REQUIRED)

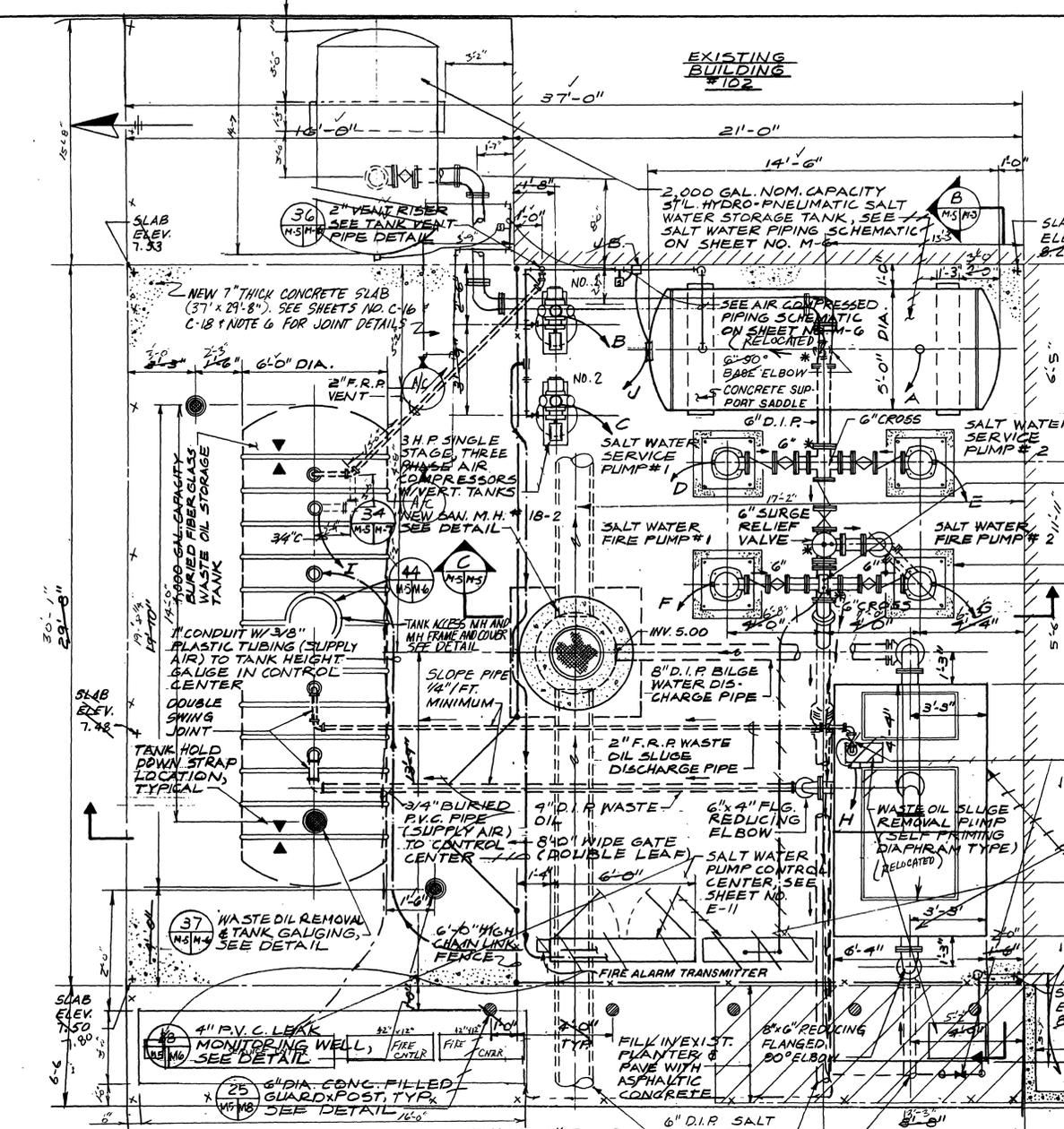
- EXISTING BUILDING #102**
- 2" NO SOLENOID VALVE TO CLOSE WHEN WASTE TANK IS FULL
- 300 GAL. CAPACITY VERT. TUBE OIL SEPARATOR
- 1/2" CONDUIT W/ 2 3/8" (SALT WATER PRESURE) PLASTIC TUBING TO CONTROL CENTER. SEE SHEET E-11 FOR DETAILS
- PROVIDE CONCRETE PIPE SUPPORTS AT THESE LOCATIONS.



**SECTION A**  
SCALE: 3/8" = 1'-0"



**SECTION B**  
SCALE: 3/8" = 1'-0"

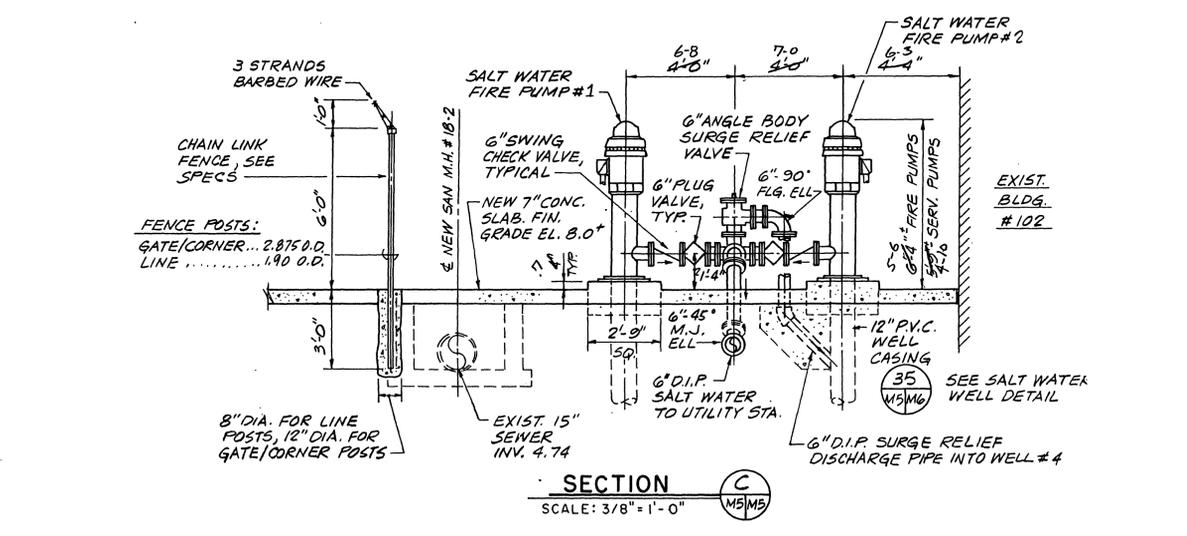
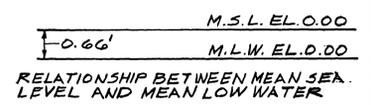


**SALT WATER WELLS / OIL SEPARATOR SITE PLAN**  
SCALE: 3/8" = 1'-0"

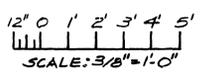
- LEGEND**
- CONDUIT HOME RUNS TO CONTROL CENTER
  - PLASTIC TUBING & P.V.C. PIPE TO CONTROL CENTER

CONDUIT DESIGNATION	CONDUIT SIZE	DESCRIPTION
A	3/4"	DIFF. PRESS. XMITTER 2-#12 CONDUCTORS
B	3/4"	AIR COMPRESSOR NO. 1 3-#12 CONDUCTORS
C	3/4"	AIR COMPRESSOR NO. 2 3-#12 CONDUCTORS
D	1"	SERVICE PUMP #1 3-#8 CONDUCTORS
E	1"	SERVICE PUMP #2 3-#8 CONDUCTORS
F	2"	FIRE PUMP #1 3-#10 CONDUCTORS
G	2"	FIRE PUMP #2 3-#10 CONDUCTORS
H	3/4"	SLUDGE PUMP 3-#12 CONDUCTORS PLUS 2-#12 CONDUCTORS FOR SOLENOID VALVE
I	3/4"	HIGH LEVEL ALARM 2-#12 CONDUCTORS
J	3/4"	FLOAT SWITCH AND SOLENOID VALVE 4-#12 CONDUCTORS

DESCRIPTION	NO.	CAPACITY/SIZE
HYDRO-PNEUMATIC TANK	1	2,000 GAL.
SALT WATER WELLS	4	12" DIA.
SERVICE PUMPS	2	500 GPM @ 54 PSI G
FIRE PUMPS	2	500 GPM @ 178 PSI G
OIL/WATER SEPARATOR	1	300 GPM
AIR COMPRESSORS	2	11.9 CFM @ 100 PSI G
WASTE OIL TANK	1	4,000 GAL.
SALT WATER PUMP CONTROLS	1	200 AMP
SURGE RELIEF VALVE	1	6"



**SECTION C**  
SCALE: 3/8" = 1'-0"



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DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND  
SOUTHERN DIVISION  
CHARLESTON, S.C.

NAVAL AIR STATION  
KEY WEST, FLA.

PHM BERTHING WHARF  
TRUMAN ANNEX  
SALT WATER WELLS / OIL SEPARATOR DETAILS

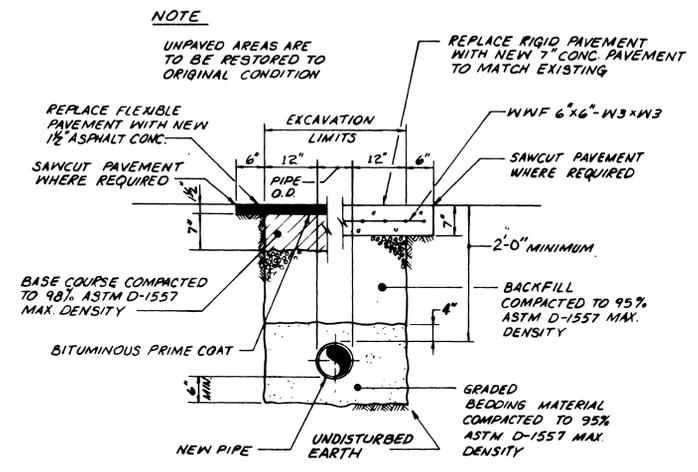
APPROVED: [Signature]  
DATE: 3/16/86

OFFICER IN CHARGE: [Signature]  
DATE: 3/16/86

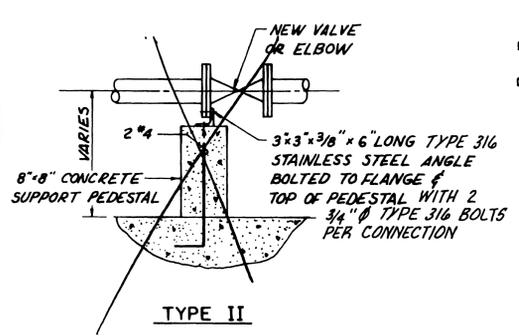
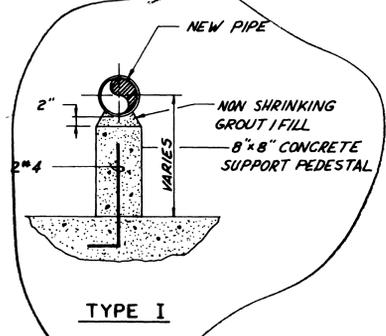
SCALE: AS NOTED

80091 5157659  
N62467-85-C-0141  
SPEC 06-85-0141 SHEET 29 OF

REV.	DESCRIPTION	PREP BY	DATE	APPROVED



**TYPICAL PIPE TRENCH DETAIL** (21)  
NO SCALE C-12, M-1, M-2 MB

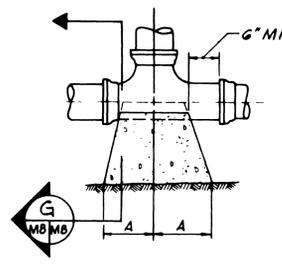
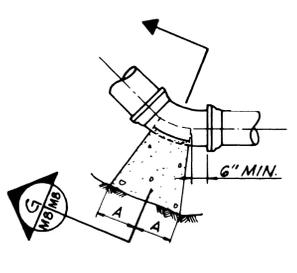


**PIPE SUPPORT DETAIL** (24)  
NO SCALE M-2, M-4, M-5, M-6, M-7 MB

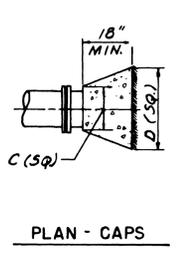
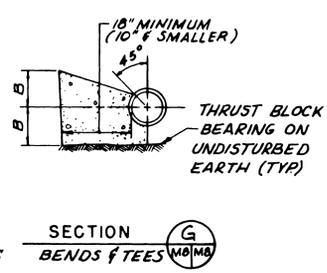
**HORIZONTAL BUTTRESS SCHEDULE**

SIZE	90° BENDS		45° BENDS		22 1/2° BENDS*		TEES		CAPS	
	A	B	A	B	A	B	A	B	C	D
4"	14"	8"	7"	8"	6"	7"	8"	10"	8"	17"
6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"

\* OR LESS



PLAN - BENDS PLAN - TEES

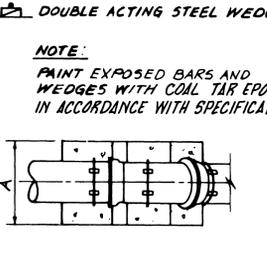
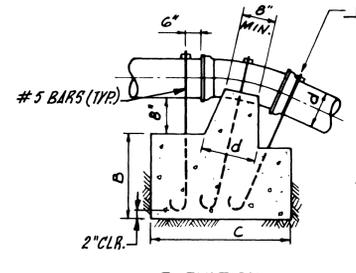


**BUTTRESSES FOR HORIZONTAL BENDS, TEES & CAPS**

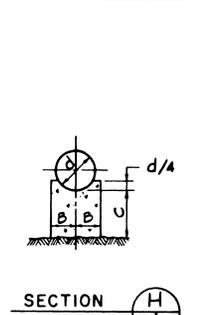
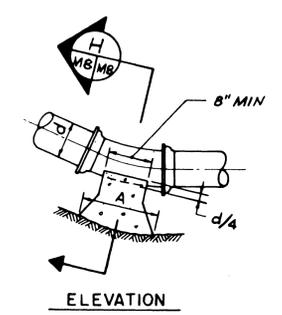
**VERTICAL BUTTRESS SCHEDULE**

SIZE	45° BENDS			22 1/2° BENDS*			45° BENDS			22 1/2° BENDS*		
	A	B	C	A	B	C	A	B	C	A	B	C
4"	15"	6"	6"	12"	6"	6"	24"	24"	30"	18"	18"	27"
6"	15"	7"	7"	12"	7"	7"	30"	30"	36"	24"	21"	30"
10"	25"	9"	10"	18"	8"	8"	48"	42"	54"	44"	30"	46"

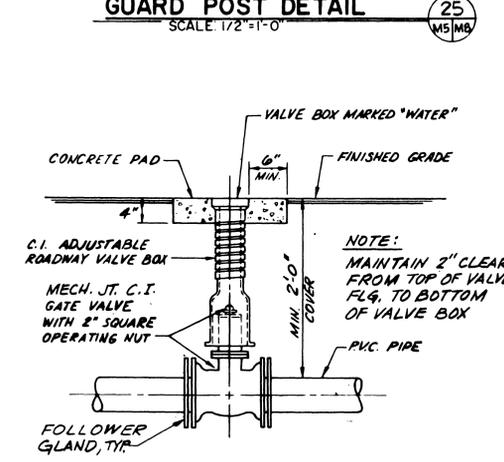
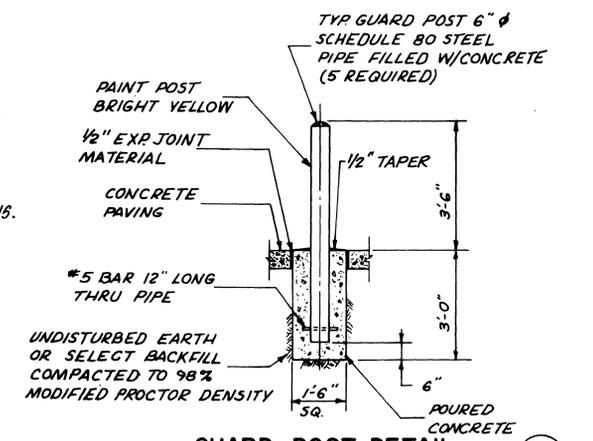
\* OR LESS



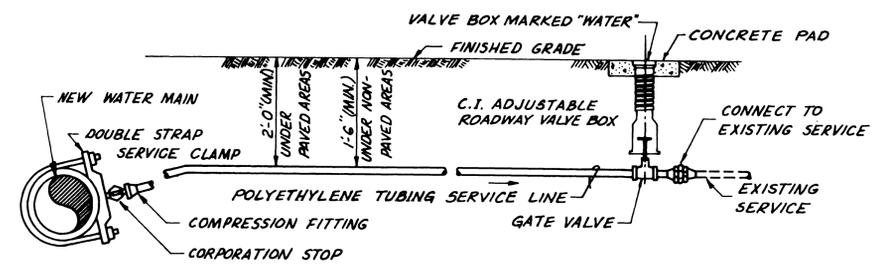
**ANCHORAGE FOR VERTICAL BENDS**



**BUTTRESSES FOR VERTICAL BENDS**

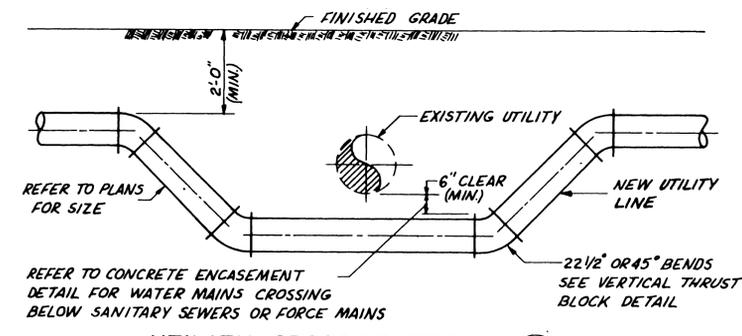


**GATE VALVE & BOX DETAIL** (23)  
NO SCALE C-12, M-1, M-2 MB

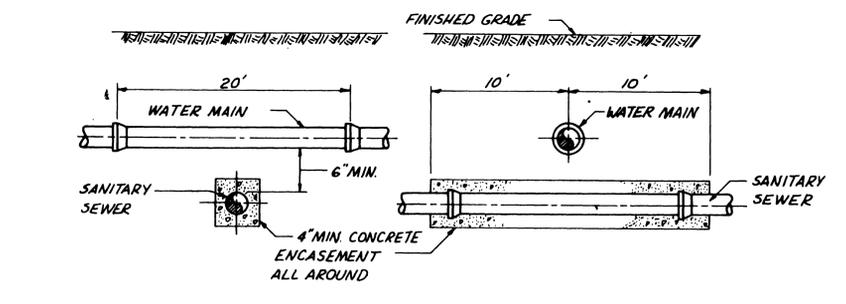


- SUCCESSIVE TAPS INTO THE WATER MAIN SHALL BE SPACED NOT LESS THAN 18" ON CENTERS.
- NEW SERVICE PIPE SHALL BE AS SHOWN.
- FOR 1" SERVICE LINES THE MINIMUM RADIUS SHALL BE 14" FOR 1 1/2" SERVICES THE MINIMUM RADIUS SHALL BE 21"

**TYPICAL WATER SERVICE CONNECTION DETAIL** (27)  
NO SCALE M-1, M-2 MB

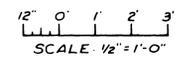


**UTILITY CROSSING DETAIL** (29)  
NO SCALE AS NECESSARY MB



- WHERE THE LOCATION OF THE WATER LINE IS NOT CLEARLY DEFINED BY DIMENSIONS ON THE DRAWINGS, DO NOT LAY WATER LINE CLOSER HORIZONTAL THAN 10 FEET FROM ANY SEWER LINE.
- WHERE WATER LINES CROSS UNDER GRAVITY SEWER LINES, ENCASE SEWER LINE FULLY IN CONCRETE FOR A DISTANCE OF AT LEAST 10 FEET ON EACH SIDE OF THE CROSSING, UNLESS SEWER LINE IS MADE OF PRESSURE PIPE WITH RUBBER-GASKETED JOINTS AND NO JOINT IS LOCATED WITHIN 3 FEET HORIZONTALLY OF THE CROSSING.
- LAY WATER LINES WHICH CROSS SEWER FORCE MAINS AT LEAST 2 FEET ABOVE SEWER LINES; WHEN JOINTS IN THE SEWER LINE ARE CLOSER THAN 3 FEET HORIZONTALLY FROM THE WATER LINE, ENCASE JOINTS IN CONCRETE.
- CONSTRUCTION SHALL CONFORM WITH SPECIFICATION 02713 PARAGRAPH 3.1.1.1

**CONCRETE ENCASEMENT DETAIL** (28)  
NO SCALE AS NECESSARY MB



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DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING DIVISION SOUTHERN DIVISION CHARLESTON, S.C.

NAVAL AIR STATION KEY WEST, FLA.

PHM BERTHING WHARF TRUMAN ANNEX UTILITY DETAILS

APPROVED: [Signature] DATE: 6/30/84

OFFICER IN CHARGE DATE: 6/16/84

APPROVED: [Signature] DATE: 6/16/84

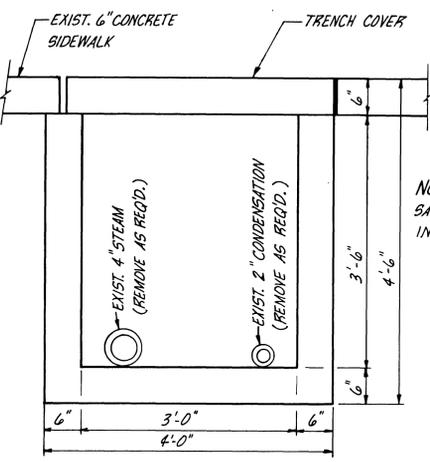
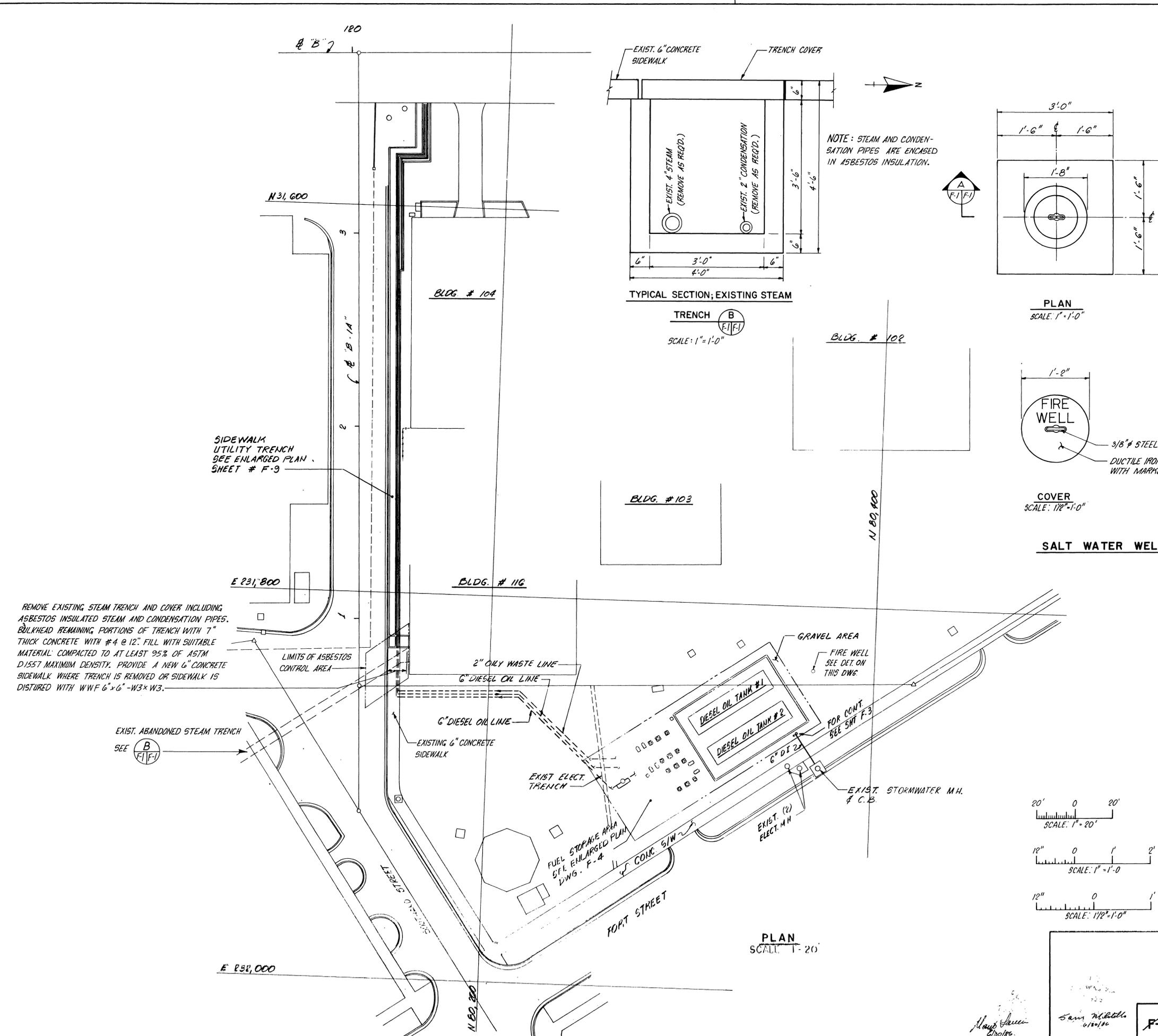
ARCH & ENGR SEAL

SIZE: F CODE: 80091 NAVFAC DRAWING NO: 5157662

CONSTR CONT NO: N62467-85-C-0141

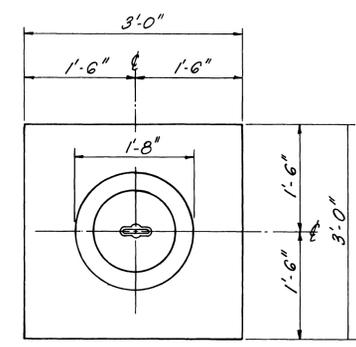
SCALE: AS NOTED SPEC: 06-85-0141 SHEET: 32 OF

REVISIONS			
LET	DESCRIPTION	PREP BY	DATE

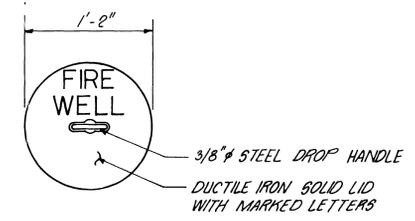


TYPICAL SECTION, EXISTING STEAM  
TRENCH B  
SCALE: 1"=1'-0"

NOTE: STEAM AND CONDENSATION PIPES ARE ENCASED IN ASBESTOS INSULATION.

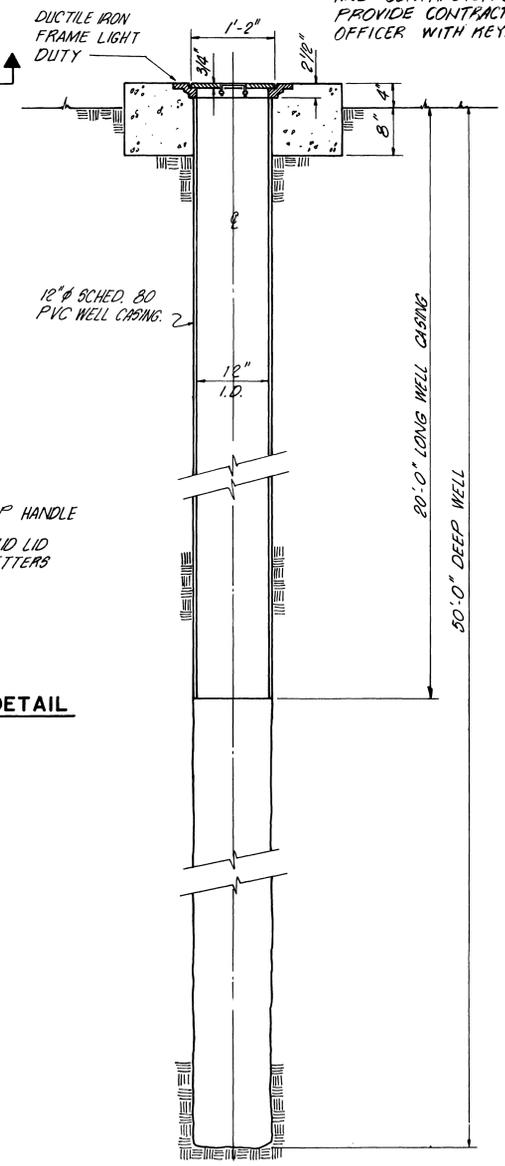


PLAN  
SCALE: 1"=1'-0"



COVER  
SCALE: 1/2"=1'-0"

SALT WATER WELL DETAIL



SECTION  
SCALE: 1"=1'-0"

NOTE: FOR LEGEND SEE DRAWING C-2.

NOTE: LID SHALL BE LOCKABLE AND CONTRACTOR SHALL PROVIDE CONTRACTING OFFICER WITH KEY.

REMOVE EXISTING STEAM TRENCH AND COVER INCLUDING ASBESTOS INSULATED STEAM AND CONDENSATION PIPES. BULKHEAD REMAINING PORTIONS OF TRENCH WITH 7" THICK CONCRETE WITH #4 @ 12". FILL WITH SUITABLE MATERIAL COMPACTED TO AT LEAST 95% OF ASTM D1557 MAXIMUM DENSITY. PROVIDE A NEW 6" CONCRETE SIDEWALK WHERE TRENCH IS REMOVED OR SIDEWALK IS DISTURBED WITH WWF 6"x6"-W3xW3.

SIDEWALK UTILITY TRENCH SEE ENLARGED PLAN SHEET # F-9

LIMITS OF ASBESTOS CONTROL AREA

2" OILY WASTE LINE  
6" DIESEL OIL LINE

EXISTING 6" CONCRETE SIDEWALK

EXIST. ELECT. TRENCH

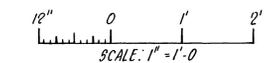
FUEL STORAGE AREA SEE ENLARGED PLAN DWG. F-4

GRAVEL AREA  
FIRE WELL SEE DET. ON THIS DWG

FOR CONT. SEE SHEET F-3

EXIST. STORMWATER M.H. & C.B.

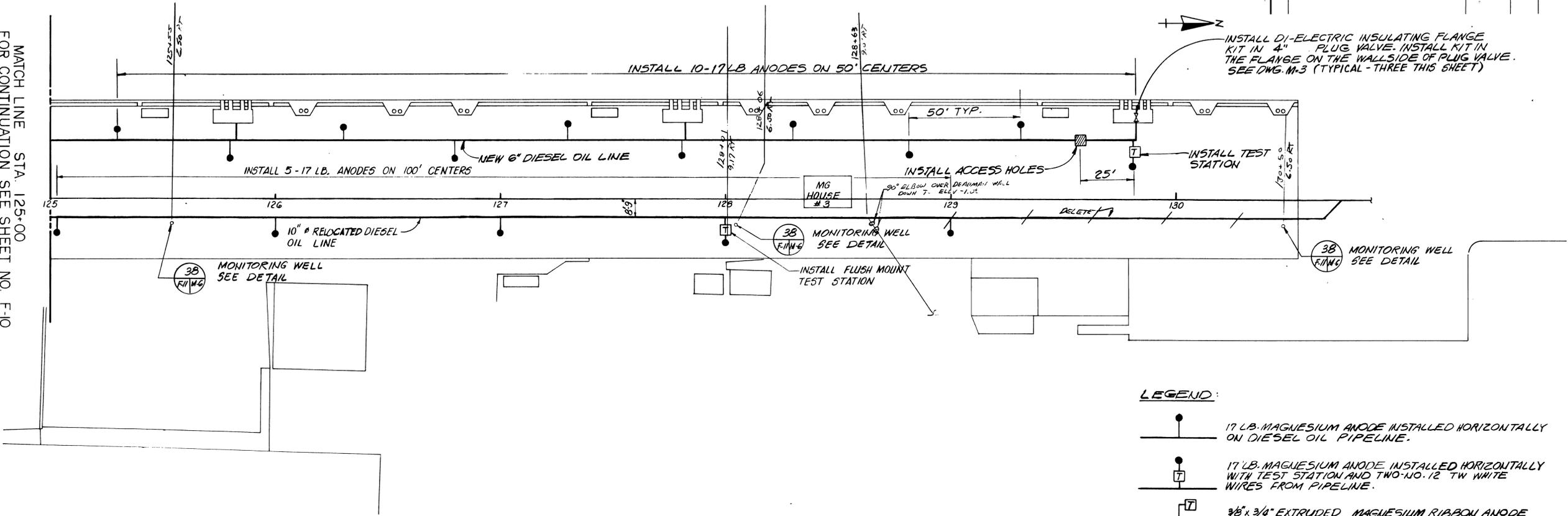
PLAN  
SCALE: 1"=20'



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Griner Engineering Services, Inc. REGISTERED ENGINEERS 12504 20th St. N. ALBUQUERQUE, N.M. 87112	THE DEPARTMENT OF THE NAVY NAVAL AIR STATION KEY WEST, FLA.
PROJECT: PHM BERTHING WHARF TRUMAN ANNEX FUEL OIL DISTRIBUTION SYSTEM DRAWING TITLE: SALT WATER WELL DETAIL DATE: 4/12/86 BY: SAUNDERS CHKD: SAUNDERS	PHM BERTHING WHARF TRUMAN ANNEX FUEL OIL DISTRIBUTION SYSTEM
APPROVED: [Signature] OFFICER IN CHARGE DATE: 4/12/86	CODE IDENT NO: F 80091 NAVAL DRAWING NO: 5157663
ARCH & ENGR SEAL	CONSTR CONTR NO: N62467-85-C-0141 SPEC: 06-85-0141 SHEET 33 OF 33

REVISIONS			
LET	DESCRIPTION	PREP BY	DATE

MATCH LINE STA. 125+00  
FOR CONTINUATION SEE SHEET NO. F-10



**LEGEND:**

- 17 LB. MAGNESIUM ANODE INSTALLED HORIZONTALLY ON DIESEL OIL PIPELINE.
- 17 LB. MAGNESIUM ANODE INSTALLED HORIZONTALLY WITH TEST STATION AND TWO-NO. 12 TW WHITE WIRES FROM PIPELINE.
- 3/8" x 3/4" EXTRUDED MAGNESIUM RIBBON ANODE WITH TEST STATION INSTALLED IN UTILITY TRENCH AND CENTERED BETWEEN PIPELINES.
- ACCESS HOLE TO SOIL DIRECTLY OVER PIPELINE, CENTERED BETWEEN ANODES.
- NO. 8 HMWPE BOND CABLE THERMIT WELDED TO 2.6" DIESEL PIPELINES.

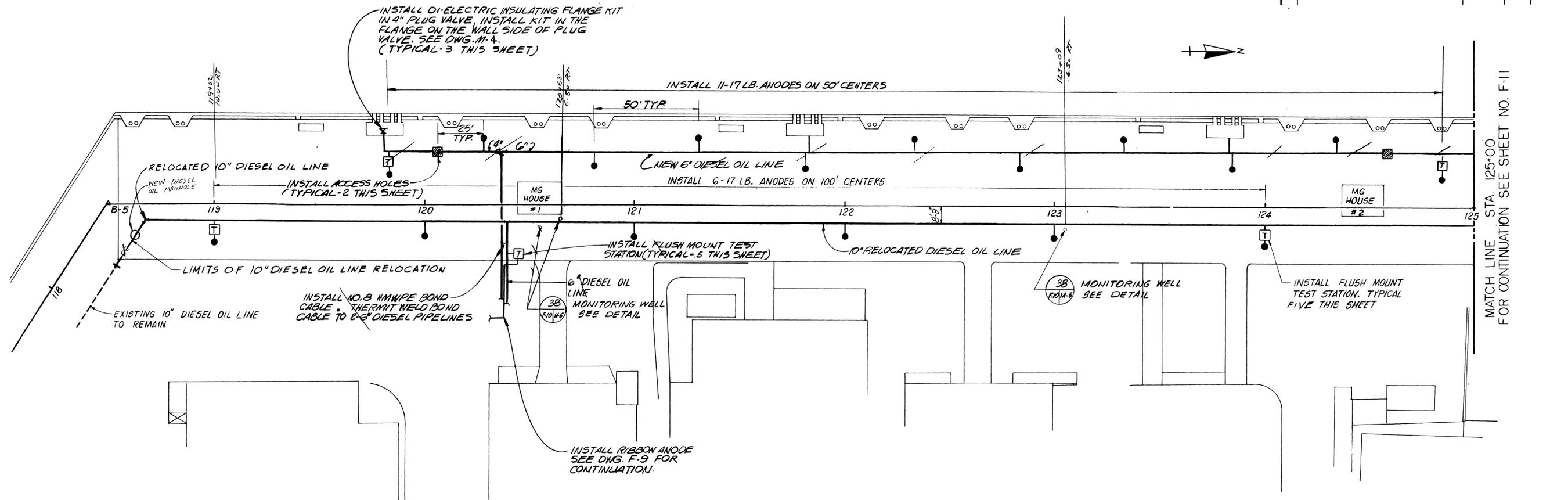
**NOTES:**

- 1 - ALL 17 LB. ANODES TO BE INSTALLED HORIZONTALLY AND PARALLEL TO PIPE.
- 2 - BOND CABLE BETWEEN 2.6" DIESEL PIPELINES TO BE NO. 8 HMWPE CABLE, THERMIT WELD CABLE TO BOTH PIPES AND REPAIR COATING.
- 3 - MAGNESIUM RIBBON ANODE TO BE INSTALLED IN UTILITY TRENCH AND CENTERED BETWEEN PIPELINES. RIBBON ANODE TO BE INSTALLED TO A MINIMUM DEPTH EQUAL TO THE DEPTH OF THE BOTTOM OF THE PIPELINES.

20' 10' 0' 20'  
SCALE: 1" = 20'

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Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA DESIGNER: LARREA, RODRIGUEZ, LARREA SUPV: WALKER CH ENGR: MILITELLO SUBMITTED BY: [Signature] DATE: 4/14/85 FIRM MEMBER TITLE: [Signature] EIC: [Signature] DIR: [Signature]	
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND <b>SOUTHERN DIVISION</b> CHARLESTON, S. C. NAVAL AIR STATION KEY WEST, FL A <b>PHM BERTHING WHARF TRUMAN ANNEX</b> PIPING RELOCATION AND CATHODIC PROTECTION-NORTH	
APPROVED: [Signature] OFFICER IN CHARGE: [Signature] ARCH. & ENGR. SEAL: [Signature]	SIZE: F CODE IDENT NO: 80091 NAVFAC DRAWING NO: 5157673 CONSTR CONTR NO: N62467-85-C-0141 SPEC: 06-85-0141 SHEET: 43 OF

REVISIONS			
LET	DESCRIPTION	PREP BY	DATE

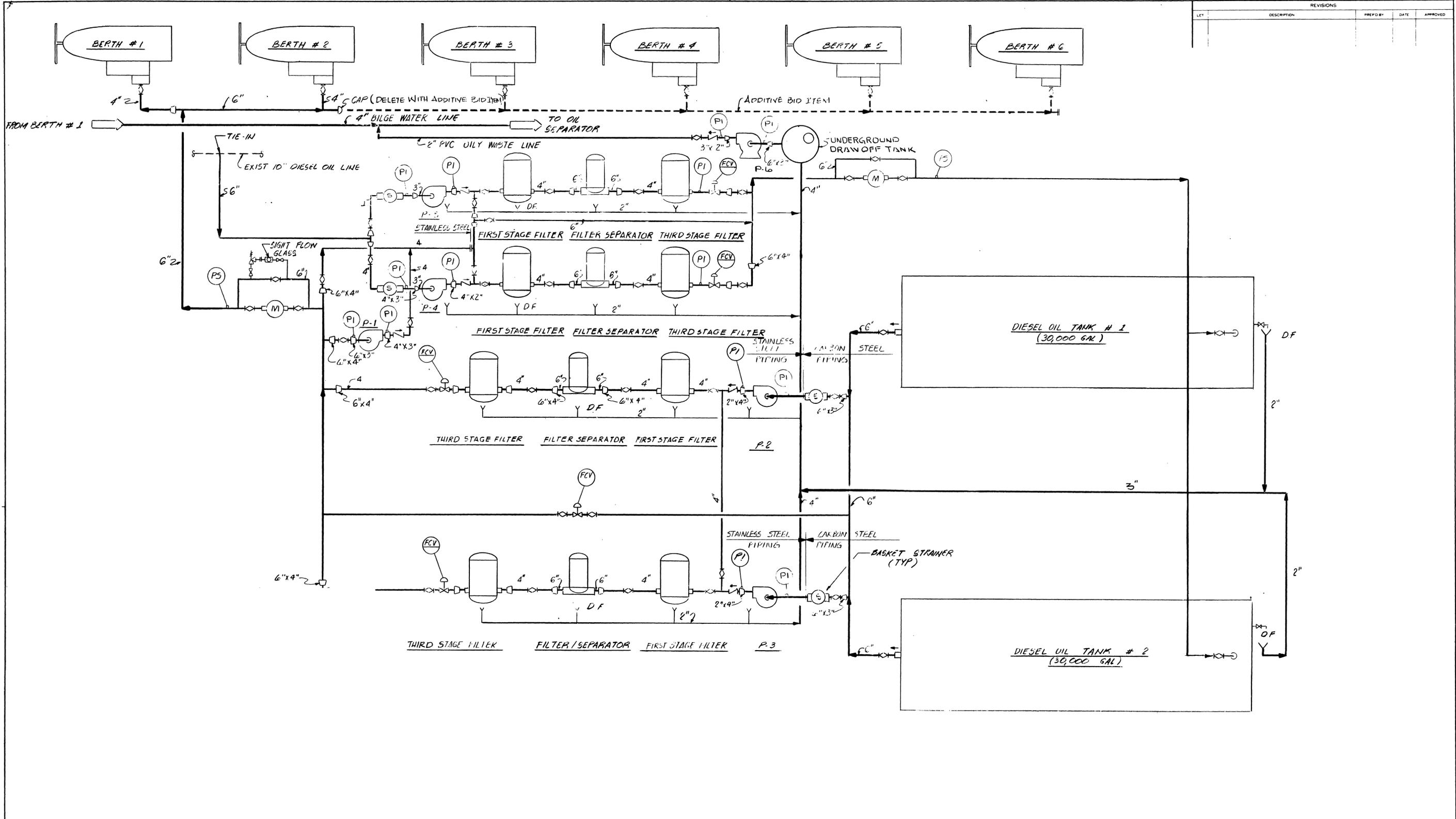


MATCH LINE STA. 125+00  
FOR CONTINUATION SEE SHEET NO. F-11

20' 10' 0' 20'  
SCALE: 1" = 20'

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DESIGNER: LARRA, D. RODRIGUEZ, M. LARRA SUPERVISOR: WALKER, CH ENGR MILITELLO		NAVAL AIR STATION KEY WEST, FLA.	
SUBMITTED BY: S. M. Little, EUP 6/20/86 DATE: 6/20/86		<b>PHM BERTHING WHARF TRUMAN ANNEX</b>	
EIC: S. M. Little, DIR FPE: _____		PIPING RELOCATION AND CATHODIC PROTECTION-SOUTH	
APPROVED: _____ OFFICER IN CHARGE	DATE: _____	SIZE: F	CODE IDENT NO: 80091
APPROVED: _____ ELECTRONIC COMMANDER NAVFAC	DATE: 3/14/86	SCALE: 1" = 20'	NAVFAC DRAWING NO: 5157672
ARCH & ENGR SEAL		CONSTR CONTR NO: N62467-85-C-0141	
		SPEC: 06-85-0141 SHEET 42 OF 42	



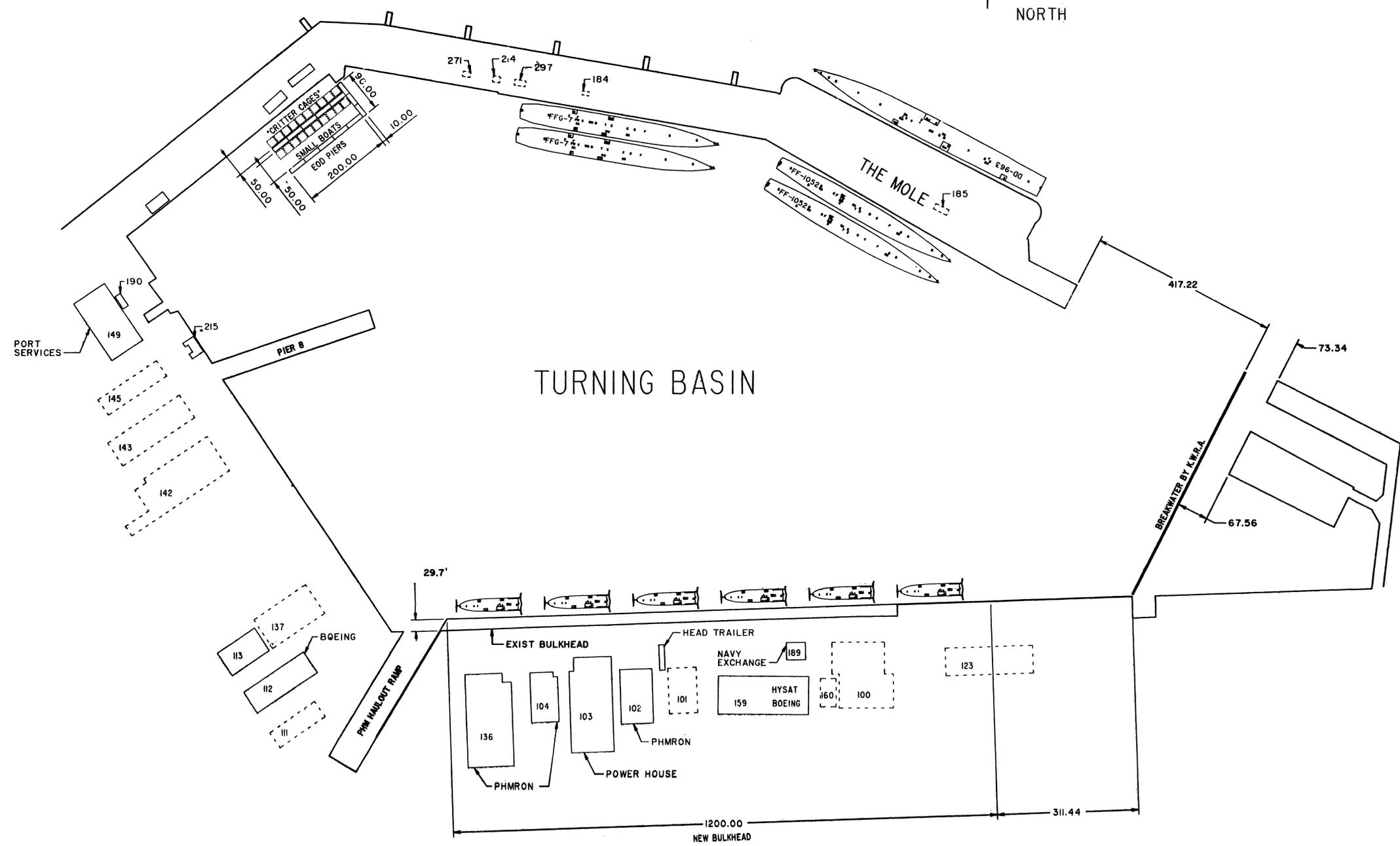
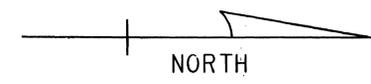
REVISIONS			
LET	DESCRIPTION	PREP BY	DATE

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Griner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA		NAVAL FACILITIES ENGINEERING COMMAND SOUTHERN DIVISION CHARLESTON, S.C.	
DESIGN: LARREA-MARTINEZ CHEN LARREA		NAVAL AIR STATION KEY WEST, FLA.	
SUBMITTED BY: WAIKER CHENGA MILITELLO		PHM BERTHING WHARF TRUMAN ANNEX FLOW DIAGRAM	
DATE: 6/20/06		NAVFAC DRAWING NO: 5157664	
DRAWN BY: EVO		OFFICER IN CHARGE: F 80091	
DATE: 3/14/06		CONSTR CONTR NO: N62467-85-C-0141	
SCALE: NONE		SPEC: 06-85-0141	
SHEET: 38 OF 40			

ARCH & ENGR SEAL  
 Sam Milillo  
 6/20/06  
 6/20/06

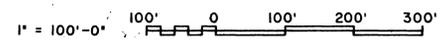
F-2

REVISIONS			
LET	DESCRIPTION	PREP'D BY	DATE



TURNING BASIN

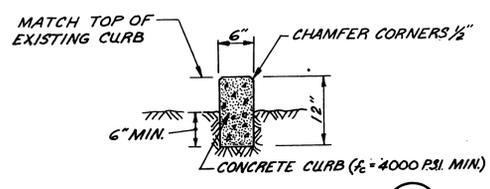
BERTHING PLAN



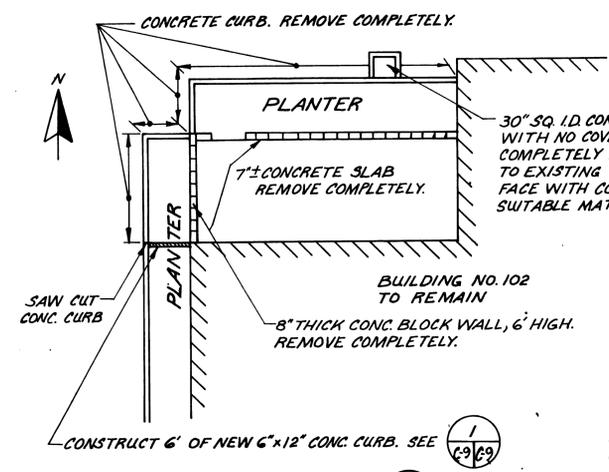
DESIGNED BY <b>E.H. STEHMEYER, JR., P.E.</b>	DEPARTMENT OF THE NAVY <b>SOUTHERN DIVISION</b>	NAVAL FACILITIES ENGINEERING COMMAND CHARLESTON, SC
DRAWN BY <b>SOUTHNAVFAC CADDS</b>	NAVAL AIR STATION KEY WEST FLORIDA	
CHECKED BY <b>E.H. STEHMEYER, JR., P.E.</b>	<b>PHM BERTHING WHARF</b>	
IN CHARGE <b>T.E. KNISLEY</b>	<b>TRUMAN ANNEX</b>	
PROJ. ENGR. <i>[Signature]</i>	<b>BERTHING PLAN</b>	
DIRECTOR	APPROVED <i>[Signature]</i>	DATE 3/16/86
	SIZE F	CODE IDENT. NO. 80091
		NAVFAC DRAWING NO. 5157702
		CONTRACT NUMBER NO. N62467-85-C-0141
	SCALE AS NOTED	SPRINT 06-85-0141

S-16

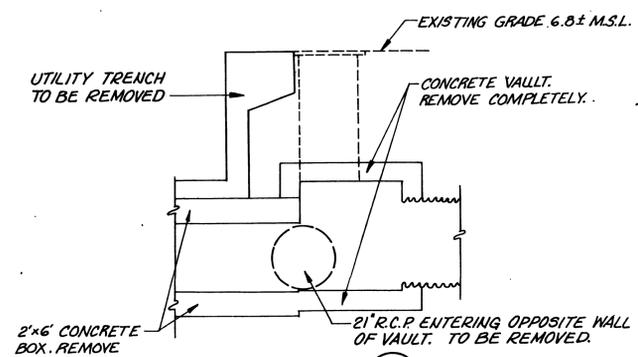
REVISIONS				
LET	DESCRIPTION	PREP BY	DATE	APPROVED



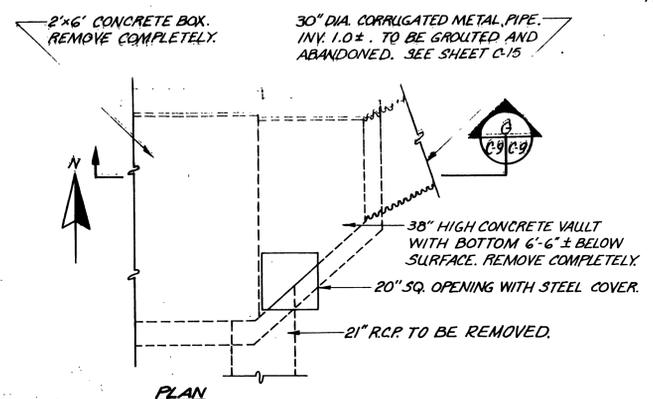
**BUILDING 102 PLANTER CURB DETAIL**  
SCALE: 1/2" = 1'-0" (C9/C9)



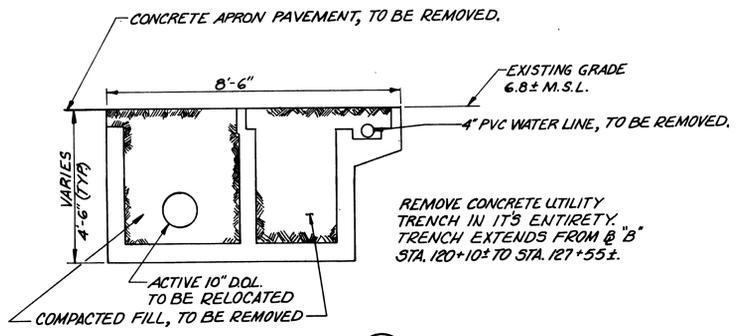
**BUILDING 102 AREA DEMOLITION DETAIL**  
SCALE: 1/8" = 1'-0" (C9/C9)



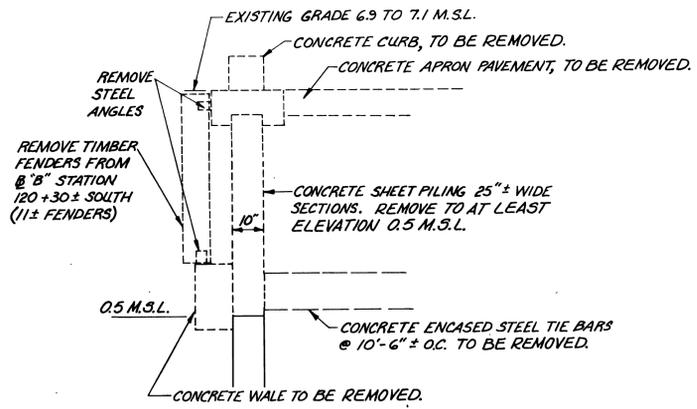
**SECTION G**  
SCALE: 1/4" = 1'-0" (C9/C9)



**DETAIL 3**  
SCALE: 1/4" = 1'-0" (C7/C9)

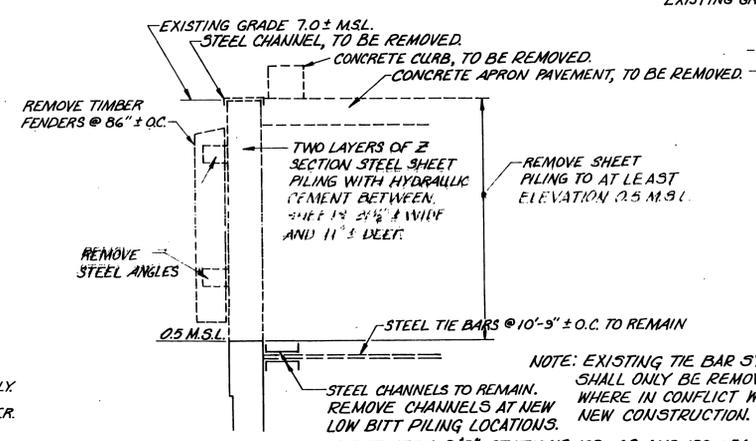


**UTILITY TRENCH SECTION A**  
SCALE: 1/2" = 1'-0" (C5, C6, C7)



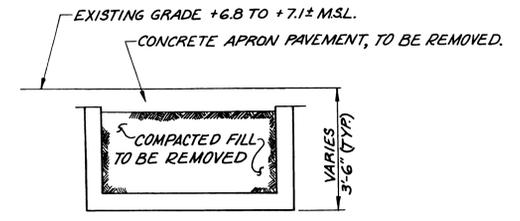
**SECTION APPLIES FROM @ "B" STATION 128+47 SOUTH.**

**BULKHEAD DEMOLITION SECTION B**  
SCALE: 1/2" = 1'-0" (C5, C6)

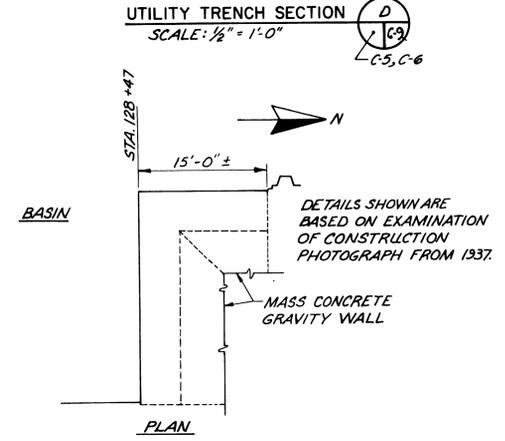


**SECTION APPLIES BETWEEN @ "B" STATIONS 128+62 AND 130+54**

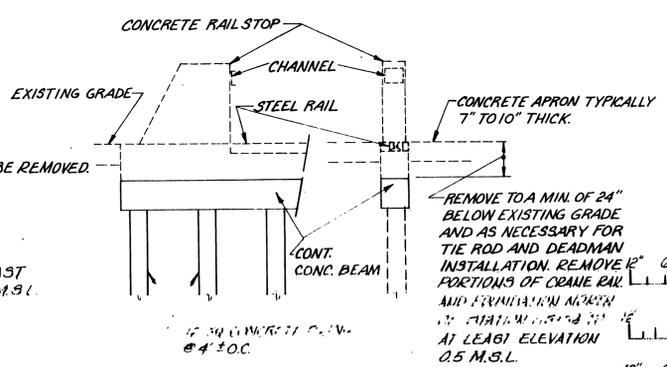
**BULKHEAD DEMOLITION SECTION C**  
SCALE: 1/2" = 1'-0" (C6/C9)



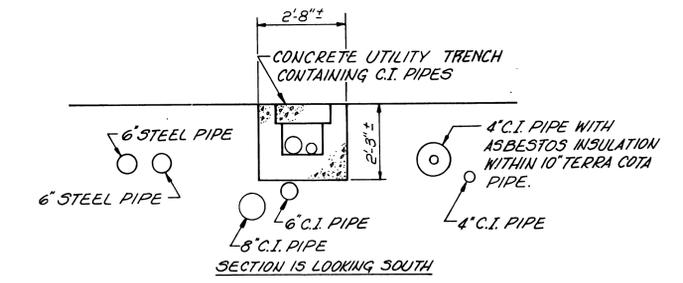
**UTILITY TRENCH SECTION D**  
SCALE: 1/2" = 1'-0" (C5, C6)



**CONCRETE GRAVITY QUAY WALL DETAIL 4**  
SCALE: 1/8" = 1'-0" (C6, S4)

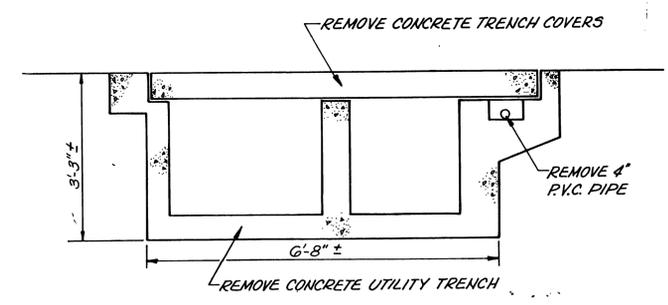


**CRANE RAIL DETAIL 5**  
SCALE: 1/4" = 1'-0" (C4, C-7)

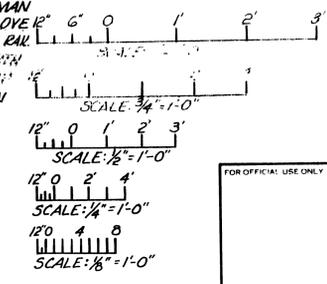


**SECTION E**  
SCALE: 1/2" = 1'-0" (C7/C9)

THE INFORMATION SHOWN ABOVE HAS BEEN EXTRACTED FROM NAVY DRAWING KW-81 DATED 3/29/52



**SECTION F**  
SCALE: 3/4" = 1'-0" (C7/C9)



M.S.L. EL. 0.00  
M.L.W. EL. 0.00  
RELATIONSHIP BETWEEN MEAN SEA LEVEL AND MEAN LOW WATER

FOR OFFICIAL USE ONLY		DEPARTMENT OF THE NAVY	
Greiner Engineering Sciences, Inc. CONSULTING ENGINEERS TAMPA, FLORIDA		NAVAL FACILITIES ENGINEERING COMMAND SOUTHERN DIVISION CHARLESTON S.C.	
DESIGN: EVANS, MUNCHING, WALKER SUPERVISOR: WALKER SUPERVISOR: CHEN, MURIELLO SUBMITTED BY: M. J. [unclear] DATE: 01/21/80 PROJECT TITLE: PHM BERTHING WHARF TRUMAN ANNEX DRAWING TITLE: DEMOLITION SECTIONS AND DETAILS		NAVAL AIR STATION KEY WEST, FLA.	
APPROVED: [Signature] DATE: 1/16/80		NAVFAC DRAWING NO. 5157639	
OFFICER IN CHARGE: [Signature] DATE: 1/16/80		CONSTRUCTION NO. N62467-85-C-0141	
ARCHITECT AND ENGINEER SEAL		SCALE: AS NOTED SPEC 06-85-0141 SHEET 9 OF 9	

# APPENDIX D

**62-713.900 Forms.**

The forms used by the Department for soil treatment facilities are adopted and incorporated by reference in this section. The form is listed by rule number, which is also the form number, and with the title, subject and effective date. Copies of forms may be obtained from a local District Office or by writing to the Florida Department of Environmental Protection, Solid Waste Section, MS 4565, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.

(1) Form 62-713.900(1): Application for Permit to Construct or Operate a Stationary Soil Treatment Facility, effective August 5, 1999.

(2) Form 62-713.900(2): Notification of Intent to Use a General Permit to Construct or Operate a Mobile Soil Treatment Facility, effective August 5, 1999.

(3) Form 62-713.900(3): Soil Testing Reporting Form, effective August 5, 1999.

*Specific Authority 403.061, 403.704 FS. Law Implemented 403.0877, 403.707 FS. History--New 8-5-99.*

Table A. Minimum Number of Soil Samples Required

Amount of Soil by Volume, yd <sup>3</sup>	Amount of Soil by Weight, tons	Number of Discrete Samples Required for Volatile Organics	Number of Composite Samples Required for non-Volatile Organics
<100	<140	1	1
100 to <500	140 to <700	3	3
500 to <1000	700 to <1400	5	5
For each additional 500 yd <sup>3</sup>	For each additional 700 tons	1	1

Table B. Total Metals Analysis and TCLP Test Requirements

If	Exceeds	TCLP Test Criteria
Total Arsenic	100 mg/kg	5.0 mg/L
Total Barium	2000 mg/kg	100.0 mg/L
Total Cadmium	20 mg/kg	1.0 mg/L
Total Chromium	100 mg/kg	5.0 mg/L
Total Lead	100 mg/kg	5.0 mg/L
Total Mercury	4 mg/kg	0.2 mg/L
Total Selenium	20 mg/kg	1.0 mg/L
Total Silver	100 mg/kg	5.0 mg/L

# APPENDIX E

# TRUMAN WATERFRONT LUC AREA CONSTRUCTION PERMIT

## GENERAL INFORMATION:

Requestor:	Location: (Include Bldg Nos. and Streets) Truman Waterfront Park	Date of Request:
Contractor:	Subcontractors:	SWMUs/AOCs Impacted: Parcel C - Former DRMO Parcel K - City Owned portion Parcel E

## PROPOSED WORK:

Scope of Work: (Attach sketches, drawings & information outlined in Process to Conduct Construction Activities Document)

## LAND USE CONTROLS:

Current Land Use Controls on Construction Area:		
	City-owned portion of Parcel K	- Restricted to Allow Recreational Use Only.
	Parcel C: Former Defense Reutilization and Marketing Office Waste Storage Area (DRMO) Parcel	-No LUCs.
	Parcel E1	- Restricted to Allow Recreational Use Only.
	Parcel E2	- Restricted to Allow Recreational Use Only. - Engineering Control in place to prevent exposure to soil beyond two feet below land surface
	Parcel E3	- Restricted to Allow Recreational Use Only. - Engineering Control in place to prevent exposure to soil beyond two feet below land surface

Frequency and Date of Next LUC Inspection for Construction Area:

Potential Effect of Proposed Construction on LUCs:

- Relocation or reuse of contamination impacted soil.
- Alteration to existing and required engineering controls.
- Need to implement provisions specified in Soil and Groundwater Management Plan. This provisions include but are not limited to:
  - \*Restriction on soil reuse and relocation.
  - \*Soil storage and disposal protocols.
  - \*Equipment decontamination.
  - \*Dust and Sediment control.
  - \*Tree removal and relocation.
  - \*Record keeping and notifications.

**CERTIFICATIONS:**

As a representative of the property owner of the subject property, I hereby certify that: (check all that apply)

- I possess an updated copy of the LUC Areas Map.
- I possess an updated copy of the approved Soil and Groundwater Management Plan.
- I acknowledge that residual contamination exists on the subject property and protocols and provisions described in the Soil and Groundwater Management Plan must be observed and implemented at all times.
- I acknowledge that residual contamination exists on the subject property and am aware that further information on site contaminants beyond the information provided in the Soil and Groundwater Management Plan can be found in the Administrative Record located at City of Key West City Hall, 3126 Flagler Avenue, Key West, Florida
- Information regarding areas of concern and contaminants will be provided to all contractors and subcontractors.
- The proposed construction will not change the land use assigned to each individual parcel.
- Personnel hazards will be controlled where construction activities have the potential to interfere with existing remedies (i.e. engineering controls).
- Dewatering will not affect migration of contaminants, and water under groundwater use restriction will be tested and properly disposed in accordance with a Dewatering Permit to be procured from local and state agencies as necessary.
- Soil excavated within designated LUC areas will be tested and properly disposed of per the provisions included in the Soil and Groundwater Management Plan.
- Exposure assumptions used in deriving LUCs will not be altered.
- Soil excavation, stockpiling, relocation/resuse and disposal will be monitored and documented during construction activities.
- Any previously unknown contamination that is discovered will be reported immediately to the Navy and the City of Key West.

Signature of Requesting Official:

Printed Name and Phone Number:

Date:

**Navy Review:**

- Requestor Authorized to Proceed
- Further Information is Requested
- Permit Denied

Signature: \_\_\_\_\_

Navy RPM/BEC

Date out: \_\_\_\_\_

Serial No: \_\_\_\_\_

(Authorization to proceed does not constitute approval of methods by which environmental, safety, and other regulations are satisfied.)

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**PART 5**

**REPORT OF GEOTECHNICAL EXPLORATION**

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**REPORT OF  
GEOTECHNICAL EXPLORATION**

**TRUMAN WATERFRONT PARK  
WEST OF FORT STREET,  
NORTH OF KEY WEST NAVAL BASE  
KEY WEST, FLORIDA**

**FOR**

**BERMELLO AJAMIL AND PARTNERS, INC.  
2601 SOUTH BAYSHORE DRIVE, SUITE 1000  
MIAMI, FLORIDA 33133**

**PREPARED BY**

**NUTTING ENGINEERS OF FLORIDA, INC.  
1310 NEPTUNE DRIVE  
BOYNTON BEACH, FLORIDA 33426**

**ORDER NO: 334.2**

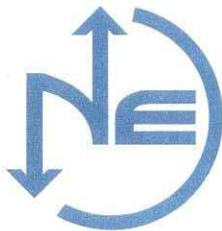
**JUNE, 2014**



*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*

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

1310 Neptune Drive  
Boynton Beach, Florida 33426  
561-736-4900  
Toll Free: 877-NUTTING (688-8464)  
Fax: 561-737-9975  
Broward 954-941-8700  
St. Lucie 772-408-1050

Miami-Dade 305-557-3882  
Palm Beach County SBE  
[www.nuttingengineers.com](http://www.nuttingengineers.com)

SFWMD SBE  
Small Business Administration SBE  
for Federal Projects

June 6, 2014

Bermello Ajamil & Partners, Inc.  
2601 South Bayshore Drive, Suite 1000  
Miami, Florida 33133  
Attn: Mr. Randy Hollingworth  
305-859-2050      Email: RHollingworth@bermelloajamil.com

Re: Report of Geotechnical Exploration  
Truman Waterfront Park  
West of Fort Street, North of Key West Naval Base  
Key West, Florida

Dear Mr. Hollingworth:

Nutting Engineers of Florida, Inc. has performed a geotechnical exploration for the Truman Waterfront Park Project in Key West, Florida. This exploration was performed to obtain information regarding subsurface soil conditions which was used to develop opinions regarding earthwork procedures and foundations for support of the proposed construction. This report presents our findings and recommendations based upon the information examined at the time of this evaluation.

### PROJECT INFORMATION

Plans for this project include constructing a pedestrian access bridge across Admirals Cut adjacent to the Westin Marina, a 2,525 square foot police horse stables building, a 3,000 square foot amphitheater with 250 fixed seats and a 24,304 square foot community building as part of the Truman Waterfront Park development. In addition, asphalt paved parking and drive areas will be constructed along with on-site storm water drainage facilities. At this time, structural loading conditions for the structures including the pedestrian bridge were not available and this should be provided to us once the design becomes more finalized.

Final elevations have not been provided, however, in general, it appears that final grades will be within approximately one to two feet of existing grades.

#### OFFICES

Palm Beach  
Miami-Dade  
St. Lucie

Currently, the area of the proposed buildings/amphitheater is relatively level, vacant land covered by sparse grass and trees with light tan sand and limestone fragments at the surface. There are also some asphalt paved areas within the project site.

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**

### **Soil Survey Maps**

As part of the geotechnical exploration, we have reviewed available Soil Conservation Service (SCS) survey maps for Monroe County. These SCS maps provide qualitative information about potential general shallow soil conditions in the project vicinity. This information was derived from approximately 6 ft. deep manual auger borings, aerial photo and surface feature interpretation at some point in the past (mid 1980's to early 1970's). The SCS data may or may not reflect actual current site conditions. As indicated in the Monroe County Soil Survey Map the series under exploration is Urban land. The Urban land consists of unconsolidated or heterogeneous overburden material generally consisting of crushed coralline limestone and coarse sand used for land leveling as fill. Beneath the fill layer natural silt deposits may exist or the natural limestone formation. We note that the maximum depth of the survey is approximately six feet.

### **Subsurface Exploration**

NUTTING ENGINEERS OF FLORIDA, INC. performed a total of nine Standard Penetration Test (SPT) borings (ASTM D-1586) to depths of fifteen to sixty feet below land surface. Eight borings were performed for the proposed buildings/amphitheater, and one boring was performed for the proposed pedestrian bridge. We note that two borings were proposed for the pedestrian bridge, however, due to accessibility limitations, only one boring could be performed at this time. In addition, two double ring infiltration tests and one exfiltration test was performed for site drainage information.

The location of the test borings and infiltration/exfiltration tests are indicated on the Boring Location Plan (Figure 1) presented in the Appendix of this report. The boring locations were identified in the field using approximate methods; namely, a measuring wheel and available surface controls. As such the soil boring locations should be considered to be approximate.

### **Test Boring Results**

In general, the borings within the buildings/amphitheater revealed approximately three to four feet of medium dense to dense tan silty sand and limestone fragments (fill material) underlain by

a soft to very soft light tan silt/marl to a depth of about six feet. Alternating layers of tan to brown sand and medium to hard porous tan limestone with sand lenses was then encountered to a depth of twenty-five feet. At the pedestrian bridge area, the silt layer was encountered from approximately fifteen to twenty-five feet, underlain by tan cemented sand and coralline limestone to sixty feet, the maximum depth explored. Please see the enclosed soil classification sheet in the Appendix of this report for additional important information regarding these descriptions, the field evaluation and other related information.

It is possible that the sandstone/limestone formation encountered may extend to greater depths and be present in areas other than recorded in the test boring. Generally, rock in the Monroe County area may include limestone or sandstone which have irregularities and discontinuities including vertical and horizontal solution features, varying surface and bottom elevations, and varying degrees of hardness. The rock features may also contain intervening sand and other material filled lenses.

### **Laboratory Testing and Analysis**

Representative soil samples were collected during the fieldwork and returned to the laboratory for testing. Specifically, natural water content tests and minus 200 sieve tests were performed on the soft to very soft silt/marl material encountered in borings B-2 to B-5 and B-8 from approximately three to six feet. The natural water content was determined to range from 38 to 57 percent. The minus 200 sieve tests revealed 82 to 96 percent of the soils passed the No. 200 sieve. This indicates that the soils are moderately compressible.

### **Infiltration Test Results**

As part of the study for this project, two double ring infiltration tests were performed in general accordance with ASTM D3385 specifications. The results of the testing indicated an infiltration rate ranging from 4.08 to 7.35 inches per hour. Please refer to the individual test Reports presented in the Appendix for specific information.

### **Exfiltration test Results**

One 'Usual Open-Hole' exfiltration test was performed in general accordance with South Florida Water Management District (SFWMD) specifications to a depth of fifteen feet below the existing ground surface. The test was performed in order to determine the hydraulic conductivity of the in situ subsurface soils to evaluate drainage requirements for the project. The hydraulic conductivity value at the location tested was determined be approximately  $5.15 \times 10^{-4}$  cubic feet per second, per square foot, per foot of head. Detailed soil descriptions and flow rates are presented in the Appendix.

## Groundwater Information

The immediate groundwater level was measured at the boring locations at the time of drilling. The groundwater level was encountered at depths of approximately six to nine feet below the existing ground surface.

The immediate depth to groundwater measurements presented in this report will not provide a reliable indication of stabilized or more long term depth to groundwater at this site. Water table elevations can vary dramatically with time through rainfall, droughts, storm events, flood control activities, tidal activity, pumping and many other factors. For these reasons, this immediate depth to water data should not be relied upon alone for project design considerations.

Further information regarding stabilized groundwater elevations at the site could be developed upon specific request. Additional evaluation might include installation and monitoring of piezometers, documenting tidal activity, flood control canals and other surface water bodies.

## ANALYSIS AND RECOMMENDATIONS

The borings performed within the proposed buildings and amphitheater generally revealed a surficial sand and limestone fill material in the upper three to four feet underlain by a silt/marl stratum to depths of approximately six feet. Below the silt stratum the natural limestone formation was encountered. Due to the compressible silt/marl encountered at depths of approximately three to six feet, construction of the proposed structures over the existing soil profile would result in excessive settlements. Therefore, in order to support the structures using a shallow foundation system, we recommend that the silt be excavated and removed from the building areas and replaced with well compacted structural fill. The boring performed in the area of the pedestrian bridge encountered compressible silt at depths ranging from approximately fifteen to twenty-five feet, therefore, we recommend that the pedestrian bridge be supported on a pile foundation system.

In accordance with Monroe County Ordinances, specifically section 122 – Floodplain Management, if the buildings are located within an area covered by this Ordinance, deep foundation systems will be required. We have included the specific section of the Code for reference:

In accordance with Monroe County Ordinance Section 122-3 C: All building foundations shall rest directly on natural rock, on concrete piling driven to rock or on friction piling (concrete or wood) and shall be anchored to such rock support by holes, 16 inches in minimum diameter, augured into such rock a minimum depth of three feet and reinforced by a minimum of four #5 vertical rods extending up into the piers above a minimum of 18 inches and tied to the vertical steel of the pier. Wooden pilings shall be locked into 16-inch auger foundations by at least a #5 rebar extending through the piling and three to five inches beyond.

We were not provided information concerning whether this Ordinance applies to the proposed buildings. Therefore, we should be informed to provide additional input if this portion of the Code applies.

### **Site Preparation – Shallow Foundations**

The surficial organic soils, debris from the clearing operations, asphalt, and any unsuitable soils as determined by the Geotechnical Engineer will need to be completely removed within the construction area and to a lateral distance of at least 5 feet beyond the footprint limits, where practical. A Nutting Engineer's representative should be present to observe that the stripping operations are performed as we have discussed herein.

We note that demucking operations are contractor and site conditions dependent and that the total amount of material removed may depend on the operator's ability to effectively remove the soils without over-excavation. It will be very important that Nutting Engineers monitor these operations in order to ensure that the operator does not over excavate and possibly remove more material which does not require removal. This will save on costs and avoid the potential for confusion.

Once the construction area has been cleared, and upon approval by the geotechnical engineer, the organic soils shall then be excavated and removed from the site. Based on the soil borings, we anticipate the silt/marl soils will be encountered at depths beginning at approximately three to four feet and ending at a depth of approximately six feet although variation should be expected. The soils above this stratum can be stockpiled and used as backfill. A representative of Nutting Engineers must observe the operation on a full time basis to ensure that the engineering intent has been accomplished.

The level of the water table at the time of the test boring was about six feet below the existing ground surface. Therefore we anticipate that the excavation may fall just at or above/below the water table. We note that the water table may fluctuate due to tidal fluctuations, rainfall and other site factors. Based on the depth of the silt soils it is anticipated that dewatering operations will not be performed and the recommendations provided below reflect that condition. If dewatering is needed, our office should be notified in order to evaluate our recommendations and determine if alternative recommendations should be provided.

If dewatering is not performed, once the organic soils have been removed, fill placed below the natural groundwater level shall consist of clean sand and limestone having a Limerock Bearing Ratio (LBR) of at least 60. The fill material shall have no more than 10 percent passing the No. 200 sieve, with a maximum particle size of 3 inches. The fill may be placed in a loose state until reaching no more than two feet above the natural groundwater level.

Once the site is two feet above the water table the soils should be compacted with at least ten passes of a small self propelled vibratory roller with a minimum dynamic force of 10 tons. Also,

the surface should be compacted until a density equivalent to at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557) is achieved to a depth of at least 12 inches below the compacted surface.

Fill then placed above the proof rolled surface, and is at least two feet above the water table, may then consist of clean granular soils, free of debris and organics, and shall have no more than 10 percent passing the No. 200 sieve, with a maximum particle size of 3 inches. The fill should be placed in lifts not exceeding 12 inches in loose thickness when using the vibratory compaction equipment described previously. Each lift should be thoroughly compacted until densities equivalent to at least 98 percent of the modified Proctor maximum dry density are uniformly obtained.

The fill should have ASTM designation (D-2487) of GP, GW, SP, or SW, with a maximum particle size of no more than 3 inches or as otherwise approved by Nutting Engineers.

Following site and building pad construction as discussed above, the foundation area should be excavated and the footings formed.

The bottom of foundation excavations should be compacted after excavation to develop a minimum density requirement of 95 percent of the maximum modified Proctor dry density, for a minimum depth of two (2) feet below the bottom of the footing depth, as determined by field density compaction tests. The floor slab area should also be compacted in the same manner.

### **Pedestrian Bridge**

The pedestrian bridge is currently in the conceptual design phase at this time, therefore, structural loading conditions including compression, tension and lateral forces are not available. Due to the compressible silt encountered at depths of about fifteen to twenty-five feet, it is our recommendation that a pile foundation system be used to support the bridge. We anticipate that a compressive capacity of approximately 35 tons would be needed to provide an efficient foundation system. Once the design is more finalized, we should be informed to provide additional analyses and recommendations if needed.

The results of our pile capacity analysis indicate that a 14-inch diameter augercast pile installed to depths of approximately thirty-five feet below the existing ground surface should provide an allowable compressive capacity of 35 tons. The actual depths should be expected to vary depending on the drilling conditions encountered during installation of these piles. Due to the soil conditions encountered at this site (silt stratum and porous limestone), we anticipate large grout takes in order to construct the cast-in-place piles. If compressive capacities other than 35 tons are needed, we should be notified so that we may provide the capacity analysis based on the revised loading information.

The Florida Building Code (FBC) requires that any piles designed for greater than 40 tons should be load tested in order to verify the pile capacity. Therefore, a pile load test will not be required for this project as described in the FBC.

Based on initial drilling conditions during pile installation, final criteria for the remainder of the production piles will be provided. The installation of all piles should be under the full time observation of a representative of the Geotechnical Engineer. We recommend that at a minimum, one full length #6 reinforcing steel bar utilizing centralizers be installed in each pile in order to verify that a pile of continuous cross section is constructed. Additional reinforcing may be required depending on the structural engineers requirements.

It has been noted that due to the hard to very hard coralline limestone formation that exists abundantly within the Florida Keys piling contractors have been known to have extreme difficulty drilling to the recommended pile tip elevation. It is important that specialty contractors familiar with installing augercast piles in the project vicinity be utilized for the pile installation phase of this project.

### **Pile Observations**

We recommend that at least two production piles be installed in the presence of the Nutting project geotechnical engineer. Final pile installation criteria will be provided at that time. It is important that the installation of all piles be under the full time observation of a representative of Nutting Engineers to verify the piles are installed in accordance with our recommendations and good standard practice.

### **Pile Reinforcement**

We recommend that at a minimum, one full length #6 reinforcing steel bar utilizing centralizers be installed. Additional reinforcing may be required depending on the structural engineer's requirements.

### **Earth Pressures on Walls**

Estimated design geotechnical soil parameters were developed from the results of the test borings. The following table summarizes our recommendations for the soil parameters and the lateral active and passive pressure coefficients to be utilized for construction. The design shall include hydrostatic pressure acting behind the wall at the highest anticipated water level during construction, and/or design life of the structure.

## SUMMARY OF DESIGN GEOTECHNICAL PARAMETERS – BUILDING AREAS

APP. DEPTH (FEET)	SOIL TYPE	SOIL UNIT WEIGHT (PCF)		ANGLE OF INTERNAL FRICTION (DEGREES)	EARTH PRESSURE COEFFICIENT	
		SATURATED	SUB-MERGED		ACTIVE (Ka)	PASSIVE (Kp)
0-4	Sand and Limestone	135	73	40	0.22	4.6
4-6	Silt/Marl	85	23	10	0.70	1.4
6-25	Porous Limestone	135	73	42	0.20	5.04

Appropriate factors of safety will be needed depending on the application.

Backfill behind walls should be approved granular fill as indicated previously and should be placed in loose lifts not exceeding 12 inches in thickness and should be compacted to minimum dry density of between 92 percent and 95 percent of the maximum modified Proctor dry density using small vibratory compaction equipment. Over compaction in these areas should be avoided. The walls should be temporarily braced during compaction to prevent overstressing of the walls.

Prior to initiating compaction operations, representative samples of the structural fill material to be used and acceptable in-place soils should be collected and tested to determine their compaction and classification characteristics. The maximum dry density, optimum moisture content, gradation and plasticity characteristics should be determined. These tests are needed for compaction quality control of the structural fill and existing soils, and to determine if the fill material is acceptable.

### Excavation Requirements

Excavations of five feet or more in depth should be sloped or shored in accordance with OSHA and State of Florida requirements. Materials removed from any excavation should not be stockpiled immediately adjacent to the open excavation as this load may cause a sudden collapse of the sidewalls.

In October of 1989, as published in the Federal Registrar, Volume 54, No. 209, the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its; "Construction Standards for excavations, 29CFR part 1926, subpart P". It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. The

contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom.

### **Pavement Areas**

The results of the soil borings indicate that the silty debris zone may exist within the new parking and roadway areas. Based on the relative loads for the parking lot, it is our opinion that it is not necessary to excavate these silt/marl soils and replace them with clean backfill. We note that some increased frequency of maintenance should be anticipated if the silt soils are left in place. The decision as to what should be done within the parking areas will depend on costs, tolerance to settlements, additional fill that may be required and other factors. Discussions should be held with us, the owners and other interested parties to determine the best alternative concerning the pavement areas.

If the existing silt material is to remain, pavement areas after site clearing should be compacted to a minimum of 98 percent of the modified Proctor maximum dry density to a depth of at least 12 inches below the subgrade level. We recommend that stabilized subgrade having a minimum Limerock Bearing Ratio (LBR) of 40 be placed to a depth of approximately one foot below the base course. The base course will range from approximately 6 to 8 inches, and should have a minimum LBR of 100. It appears that the existing soil material in the upper two feet may be used for the pavement sections, however appropriate tests of the material will be needed prior to approval. The project civil engineer should also provide input concerning the pavement areas as they will prepare the project pavement and drainage plans.

### **GENERAL INFORMATION**

The contents of this report are for the exclusive use of the client, the client's design & construction team and governmental authorities for this specific project exclusively. 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 for foundation support. Environmental issues including, but not limited to, soil and/or groundwater contamination are beyond our scope of service for this project.

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 vibratory compaction equipment may cause vibrations that could be felt by persons within nearby buildings and could potentially induce structural settlements. Additionally, preexisting settlements may exist within these structures that could be construed to have been caused or

worsened by the proposed vibratory compaction after the fact. Pre- and post conditions surveys of these structures along with the vibration monitoring during vibratory compaction could be performed to better evaluate this concern. The contractor should exercise due care during the performance of the vibratory compaction work with due consideration of potential impacts on existing structures. If potential vibrations and impacts are not considered tolerable, then alternate foundation modification techniques should be considered.

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 be of service on this project. If we can be of any further assistance, or if you need additional information, please contact us at your convenience.

Sincerely,

**NUTTING ENGINEERS OF FLORIDA, INC.**



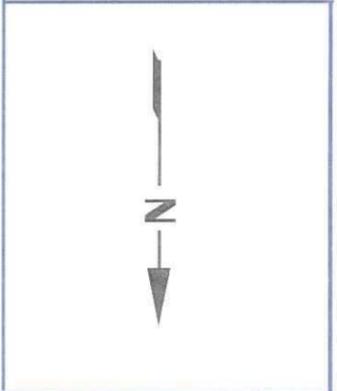
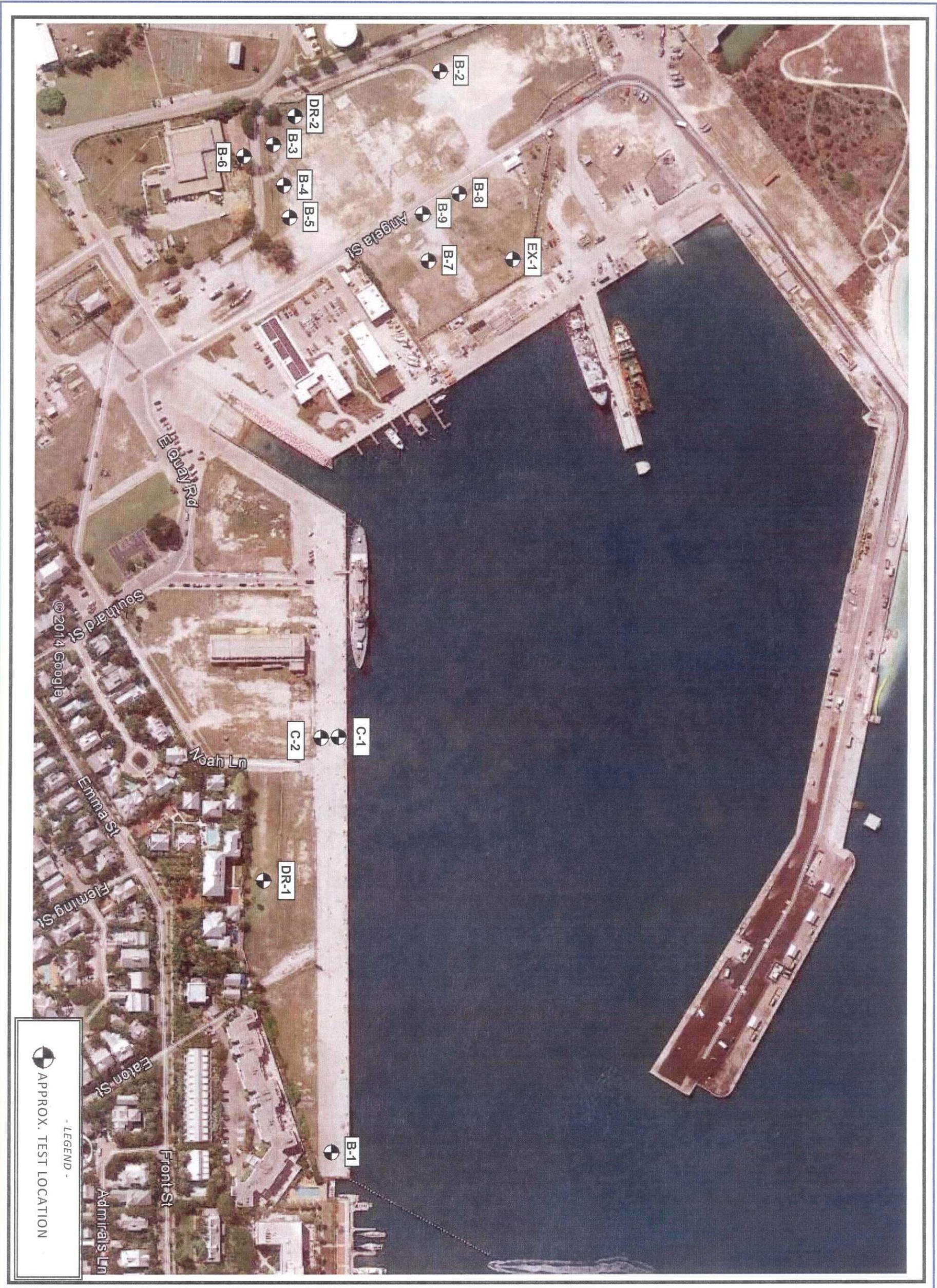
Christopher E. Gworek, P.E.  
Senior Engineer



Richard C. Wohlfarth, P.E. #50858  
Principal/Director of Engineering

Attachments: Boring, Infiltration and Exfiltration Test Location Plan  
Test Boring Reports  
Infiltration Test Results  
Exfiltration Test Results  
Soil Classification Criteria  
Limitations of Liability

Rep Bermello Ajamil Truman Waterfront Park Geo



NOT TO SCALE  
Project No. 334.2

Bermello Ajamil & Partners, Inc.  
**Truman Waterfront Park Improvements**  
 West of Fort Street, North of Key West Naval Base  
 Key West, Florida

**GEOTECHNICAL EXPLORATION**

**FIGURE 1**





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

**BORING NUMBER B-1**

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/20/14

COMPLETED 5/20/14

SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring

GROUND WATER LEVELS:

LOGGED BY P. Tyson

CHECKED BY C. Gworek

AT TIME OF DRILLING 8-9 Tidal

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	
						□ FINES CONTENT (%) □			
						20	40	60	80
0		2-inch ASPHALT BASECOURSE	AU 1						
		Tan LIMESTONE FRAGMENTS and CEMENTED SAND FRAGMENTS, trace quartz medium sand	AU 2						
5			SS 3	5-6-7-6	13		▲		
			SS 4	8-7-6-11	13		▲		
10		Tan CEMENTED SAND FRAGMENTS and quartz medium SILTY SAND	SS 5	9-13-12-10	25			▲	
		Tan CEMENTED SAND FRAGMENTS and quartz medium SAND	SS 6	9-8-7-8	15		▲		
		Tan quartz medium SILTY SAND							
15			SS 7	3-1-1	2		▲		
		Lt. tan SILT, trace quartz fine sand							
20			SS 8	1-0-7	7		▲		
25		Brown ROOT FIBERS	SS 9	0-0-1	1		▲		
		Tan CEMENTED SAND, little shell							
30			SS 10	15-14-15	29			▲	
35			SS 11	12-11-9	20		▲		
		CORAL, trace limestone fragments							
40			SS 12	16-18-17	35			▲	

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14

(Continued Next Page)

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



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**BORING NUMBER B-1**

PAGE 2 OF 2

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, 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			
						□ FINES CONTENT (%) □			
						20	40	60	80
40		Tan LIMESTONE, trace coral							
45		Gray LIMESTONE	SS 13	21-19-18	37				▲
50			SS 14	38-24-23	47				▲
55		Tan LIMESTONE, trace coral	SS 15	28-33-37	70				>> ▲
60		Bottom of hole at 60.0 feet.	SS 16	53-50/2"	100+				>> ▲

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT U.S.GDT 6/6/14



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**BORING NUMBER B-2**

PAGE 1 OF 1

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/21/14 COMPLETED 5/21/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  $\nabla$  AT TIME OF DRILLING 6.5 ft 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
						□ FINES CONTENT (%) □			
						20	40	60	80
0		Tan LIMESTONE FRAGMENTS and quartz medium SAND	AU 1						
		Brown quartz medium SAND	AU 2						
		Tan LIMESTONE FRAGMENTS and quartz medium SAND, trace coral							
5		Tan SILT	SS 3	6-2-2-1	4	▲			
		$\nabla$ Tan quartz medium SILTY SAND	SS 4	2-2-3-2	5	▲			
			SS 5	3-4-3-3	7	▲			
10		Brown quartz medium SAND, trace cemented sand, little shell	SS 6	28-33-41-47	74				>>▲
			SS 7	37-31-39	70				>>▲
15		Tan CEMENTED SAND, trace quartz medium sand							
			SS 8	21-19-17	36			▲	
20									
			SS 9	33-31-30	61				>>▲
25		Bottom of hole at 25.0 feet.							

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14



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**BORING NUMBER B-3**

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/21/14 COMPLETED 5/21/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  $\nabla$  AT TIME OF DRILLING 6.3 ft 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
						□ FINES CONTENT (%) □			
						20	40	60	80
0		Tan LIMESTONE FRAGMENTS and quartz medium SAND	AU 1						
		Lt. tan quartz medium SAND	AU 2						
		Tan quartz medium SILTY SAND							
5		Tan SILT	SS 3	1-1-3-8	4				
		$\nabla$ Tan quartz fine SAND, trace shell	SS 4	11-21-26-19	47				▲
		Tan quartz fine SAND, trace limestone fragments	SS 5	20-18-26-21	44				▲
10		Tan quartz fine SAND, trace cemented sand	SS 6	20-17-19-11	36				▲
15			SS 7	22-28-31	59				>>▲
		Bottom of hole at 15.0 feet.							

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14



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**BORING NUMBER B-4**

PAGE 1 OF 1

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/21/14 COMPLETED 5/21/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  AT TIME OF DRILLING 6.4 ft

APPROXIMATE LOCATION OF BORING As located on site plan

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14

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		Tan quartz medium SAND and LIMESTONE FRAGMENTS	AU 1						
		Tan quartz fine SAND, trace limestone fragments	AU 2						
5		Tan SILT	SS 3	1-0-1-4	1				
		Tan CEMENTED SAND, trace quartz fine sand	SS 4	25-10-5-9	15		▲		
			SS 5	25-31-28-27	59				>> ▲
10			SS 6	18-25-16-18	41				▲
		Tan CEMENTED SAND, trace quartz medium sand, little shell							▲
15			SS 7	21-23-19	42				▲
		Bottom of hole at 15.0 feet.							



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**BORING NUMBER B-5**

PAGE 1 OF 1

PROJECT NUMBER 334.2  
 CLIENT Bermello Ajamil & Partners, Inc. PROJECT NAME Truman Waterfront Park Improvements  
 PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/21/14 COMPLETED 5/21/14 SURFACE ELEVATION REFERENCE Same as road crown  
 DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:  
 LOGGED BY P. Tyson CHECKED BY C. Gworek  $\nabla$  AT TIME OF DRILLING 6.4 ft 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
						PL      MC      LL 20    40    60    80		
						<input type="checkbox"/> FINES CONTENT (%) <input type="checkbox"/> 20    40    60    80		
0		Lt. tan quartz medium SAND, trace limestone fragments	AU 1					
		Tan SILT	AU 2					
5		Tan quartz medium SILTY SAND, trace limestone fragments	SS 3	2-1-2-2	3			
		Tan CEMENTED SAND, trace quartz medium sand	SS 4	4-5-7-9	12			
			SS 5	21-28-33-31	61			>>
			SS 6	27-26-26-19	52			>>
		Tan CEMENTED SAND, trace shell, trace quartz medium sand						
15			SS 7	23-31-37	68			>>
		Bottom of hole at 15.0 feet.						

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14



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**BORING NUMBER B-6**

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/22/14 COMPLETED 5/22/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  $\nabla$  AT TIME OF DRILLING 6.3 ft 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
						□ FINES CONTENT (%) □			
						20	40	60	80
0		1-inch TOPSOIL	AU 1						
		Lt. tan quartz medium SAND, trace limestone fragments	AU 2						
		Tan quartz medium SILTY SAND							
5		Tan SILT	SS 3	0-1-4-7	5				
		Tan quartz fine SAND, trace shell and limestone fragments	SS 4	10-12-13-27	25				
		Tan quartz fine SAND, trace limestone fragments	SS 5	21-19-20-21	39				
10		Tan quartz fine SAND, trace cemented sand, little limestone fragments	SS 6	18-17-19-19	36				
			SS 7	21-23-27	50				
15		Bottom of hole at 15.0 feet.							

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14



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**BORING NUMBER B-7**

PAGE 1 OF 1

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/22/14 COMPLETED 5/22/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  $\nabla$  AT TIME OF DRILLING 6.5 ft ft

APPROXIMATE LOCATION OF BORING As located on site plan

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14

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		1-inch TOPSOIL Tan BASECOURSE and LIMESTONE FRAGMENTS, trace quartz medium sand	AU 1						
			AU 2						
5		Tan quartz medium SAND, trace limestone fragments	SS 3	12-11-10-10	21		▲		
	$\nabla$		SS 4	6-6-7-6	13		▲		
			SS 5	6-5-4-4	9		▲		
10		Lt. tan quartz medium SAND, trace shell	SS 6	4-6-15-33	21			▲	
			SS 7	26-25-19	44				▲
15		Lt. tan quartz medium SAND, trace limestone fragments							
			SS 8	18-20-17	37				▲
20		Bottom of hole at 20.0 feet.							



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**BORING NUMBER B-8**

PROJECT NUMBER 334.2

CLIENT Bermello Ajamil & Partners, Inc.

PROJECT NAME Truman Waterfront Park Improvements

PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/22/14 COMPLETED 5/22/14 SURFACE ELEVATION REFERENCE Same as road crown

DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:

LOGGED BY P. Tyson CHECKED BY C. Gworek  AT TIME OF DRILLING 6.6 ft 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		1-inch TOPSOIL	AU 1						
		Tan quartz medium SAND and LIMESTONE FRAGMENTS	AU 2						
5		Tan SILT	SS 3	3-2-1-2	3	▲			
		∇ Tan quartz medium SAND and LIMESTONE FRAGMENTS, trace shell	SS 4	8-7-6-7	13		▲		
			SS 5	5-4-4-4	8		▲		
10		Gray quartz medium SAND, trace shell	SS 6	6-7-8-8	15		▲		
		Lt. tan quartz medium SAND, trace shell, trace limestone fragments	SS 7	18-21-27	48				▲
15									
			SS 8	33-21-20	41				▲
20		Bottom of hole at 20.0 feet.							

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT US.GDT 6/6/14



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**BORING NUMBER B-9**

PROJECT NUMBER 334.2  
 CLIENT Bermello Ajamil & Partners, Inc. PROJECT NAME Truman Waterfront Park Improvements  
 PROJECT LOCATION W of Fort Street, N of Key West Naval Base, Key West, FL

DATE STARTED 5/22/14 COMPLETED 5/22/14 SURFACE ELEVATION REFERENCE Same as road crown  
 DRILLING METHOD Standard Penetration Boring GROUND WATER LEVELS:  
 LOGGED BY P. Tyson CHECKED BY C. Gworek  AT TIME OF DRILLING 6.5 ft 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		
						□ FINES CONTENT (%) □					
						20	40	60	80		
0		1-inch TOPSOIL	AU 1								
		Tan LIMESTONE FRAGMENTS, trace quartz medium sand	AU 2								
5		Tan quartz medium SAND and LIMESTONE FRAGMENTS, some silt	SS 3	2-3-6-8	9						
		Tan quartz medium SAND and LIMESTONE FRAGMENTS, trace silt	SS 4	10-11-9-6	20						
		Tan quartz medium SAND, trace limestone fragments	SS 5	5-6-7-6	13						
10		Tan quartz medium SAND, trace shell, trace limestone fragments	SS 6	8-11-13-21	24						
15			SS 7	23-27-21	48						
20			SS 8	19-22-16	38						
		Bottom of hole at 20.0 feet.									

TEST NUTTING BOREHOLE 2-334.2 BERMELO AJAMIL & PARTNERS, INC. - TRUMAN WATERFRONT PARK IMPROVEMENTS.GPJ GINT.US.GDT 6/6/14

## DOUBLE RING INFILTRMETER TEST - ASTM D3385

**CLIENT:** Bermello Ajamil & Partners, Inc.  
**TEST NO.:** 1 **TEST DATE:** 5/20/2014 **WEATHER:** Clear 85 Deg F  
**PROJECT:** Truman Waterfront Park Imp. **DRILLER:** P. Tyson  
 West of Fort Street, North of Key West Naval Base, Key West

**SOIL DESCRIPTION:** 0-1" TOPSOIL  
 1"-4' Tan quartz medium SAND, some limestone fragments

**NOTE: TEST PERFORMED AT 10 INCHES BELOW EXISTING GRADE.**

**GROUNDWATER DEPTH:** 6.2' USING 12" & 24" DIAMETER RINGS

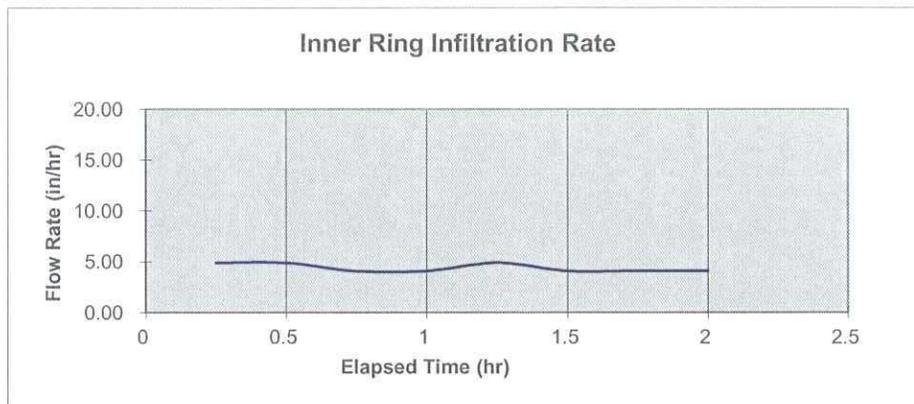
**AREA:** INNER RING: 113.1 IN<sup>2</sup> (729.7 CM<sup>2</sup>)  
 ANNULAR RING: 339.3 IN<sup>2</sup> (2189.2 CM<sup>2</sup>)

Testing was performed according to procedres specified in ASTM D3385-09. Liquid used consisted of water with an approximate pH of 7.0.

As ASTM procedure recommends, data from inner ring was used to determine infiltration rate.

ELAPSED TIME (HR)	QUANTITY OF WATER INNER(in <sup>3</sup> )	RATE INNER (IN/HR)	QUANTITY OF WATER ANNULAR(in <sup>3</sup> )	RATE ANNULAR (IN/HR)
0.25	139	4.90	554	6.54
0.5	139	4.90	531	6.26
0.75	116	4.08	531	6.26
1	116	4.08	508	5.99
1.25	139	4.90	508	5.99
1.5	116	4.08	508	5.99
1.75	116	4.08	508	5.99
2	116	4.08	508	5.99

STEADY STATE INFILTRATION RATE =	4.08	IN/HR
----------------------------------	------	-------



\* As noted in Sec. 11.1 Precision and Bias of ASTM D3385-09 the recorded infiltration rate should be considered only as an index value

Richard C. Wohlfarth, P.E. #50858  
Senior Engineer

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 Broward (954) 941-8700 • Port St. Lucie (772) 408-1050 • Miami Dade (305) 824-0060

## DOUBLE RING INFILTRMETER TEST - ASTM D3385

**CLIENT:** Bermello Ajamil & Partners, Inc.  
**TEST NO.:** 2 **TEST DATE:** 5/20/2014 **WEATHER:** Clear 85 Deg F  
**PROJECT:** Truman Waterfront Park Imp. **DRILLER:** P. Tyson  
 West of Fort Street, North of Key West Naval Base, Key West

**SOIL DESCRIPTION:** 0-1" TOPSOIL  
 1"-4' Tan quartz medium SAND and LIMESTONE FRAGMENTS

**NOTE: TEST PERFORMED AT 10 INCHES BELOW EXISTING GRADE.**  
**GROUNDWATER DEPTH:** 6.5' USING 12" & 24" DIAMETER RINGS

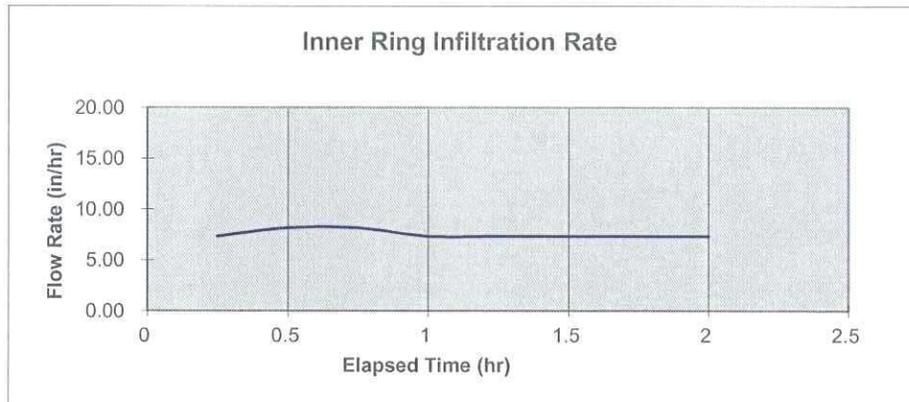
**AREA:** INNER RING: 113.1 IN<sup>2</sup> (729.7 CM<sup>2</sup>)  
 ANNULAR RING: 339.3 IN<sup>2</sup> (2189.2 CM<sup>2</sup>)

Testing was performed according to procedres specified in ASTM D3385-09. Liquid used consisted of water with an approximate pH of 7.0.

As ASTM procedure recommends, data from inner ring was used to determine infiltration rate.

ELAPSED TIME (HR)	QUANTITY OF WATER INNER(in <sup>3</sup> )	RATE INNER (IN/HR)	QUANTITY OF WATER ANNULAR(in <sup>3</sup> )	RATE ANNULAR (IN/HR)
0.25	208	7.35	647	7.63
0.5	231	8.17	647	7.63
0.75	231	8.17	624	7.35
1	208	7.35	624	7.35
1.25	208	7.35	578	6.81
1.5	208	7.35	578	6.81
1.75	208	7.35	578	6.81
2	208	7.35	578	6.81

STEADY STATE INFILTRATION RATE =	7.35	IN/HR
----------------------------------	------	-------



\* As noted in Sec. 11.1 Precision and Bias of ASTM D3385-09 the recorded infiltration rate should be considered only as an index value

Richard C. Wohlfarth, P.E. #50858  
 Director of Engineering

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## Report of Exfiltration Test

Client: Bermello Ajamil & Partners, Inc. Order No 334.2  
 Project: Truman Waterfront Park Improvements Report No 1  
 Location: W of Fort Street, North of Key West Naval Base, Key West, FL Date: 5/20/14

---

Test: Usual Open Hole Exfiltration Test

Surface: \_\_\_\_\_  
 Elevation: Same as road crown Water table from ground surface: 6.5'

Casing  
 Diameter: 6"  
 Tube Depth: 15'

Sample Location: Approx. as located on site plan

Material: 0'-0.09' 1-inch TOPSOIL  
 0.09'-6' Tan quartz medium SAND, trace limestone fragments  
 6'-7' Tan quartz medium SILTY SAND  
 7'-15' Tan quartz medium SAND, some limestone fragments

One Minute Increme	Pump Rate in Gal/Min
1	30.0
2	30.0
3	29.0
4	28.0
5	28.0
6	28.0
7	28.0
8	28.0
9	28.0
10	28.0

$K = 5.15 \times 10^{-4}$  cfs/ft<sup>2</sup>ft.head

## 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
$N \geq 100$	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.
$25 \leq N \leq 100$	Medium hard to hard	
$5 \leq N \leq 25$	Soft to medium hard	

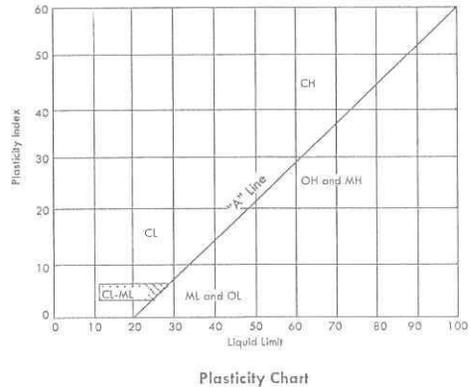
### PARTICLE SIZE

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)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3  Not meeting all gradation requirements for GW  Atterberg limits below "A" line or P.I. less than 4  Atterberg limits above "A" line with P.I. greater than 7  $C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3  Not meeting all gradation requirements for SW  Atterberg limits below "A" line or P.I. less than 4  Atterberg limits above "A" line with P.I. more than 7  Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines
		GW*	d		Silty gravels, gravel-sand-silt mixtures
			u		Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	SW	Well-graded sands, gravelly sands, little or no fines	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:  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**	
			SP		Poorly graded sands, gravelly sands, little or no fines
		SM*	d		Silty sands, sand-silt mixtures
			u		Clayey sands, sand-clay mixtures
		Sands with fines (Appreciable amount of fines)	SC		Clayey sands, sand-clay mixtures
					CL
Fine-grained soils (More than half of material is smaller than No. 200 sieve size)	Sils and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity		
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		OL	Organic silts and organic silty clays of low plasticity		
	Sils and clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or aluminous fine sandy or silty soils, elastic silts		
		CH	Inorganic clays or high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils	PT	Peat and other highly organic soils		



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**PART 6**

**TECHNICAL SPECIFICATIONS**

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END OF SECTION 000003

## SECTION 010000 - GENERAL REQUIREMENTS

## PART 1 - PROJECT DESCRIPTION

## 1.1 GENERAL

- A. 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 following additional information, though not all-inclusive, is given to assist contractors in their evaluation of the work required to meet the project objectives.
- C. 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.
- D. The CONTRACTOR shall be responsible for providing a licensed surveyor registered in the State of Florida. Surveyor shall verify all benchmarks used during survey.
- E. Soil and Groundwater Management Plan

- 1. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."**

## 1.2 STANDARD SPECIFICATIONS

- A. Portions of The Florida Department of Transportation Standard Specifications for Road and Bridge Construction and their Roadway and Traffic Design Standards, hereinafter referred to as either the Standard or FDOT Specifications, are referred to herein and amended, in part, and the same are hereby made a part of this Contract to the extent of such references and shall be as binding upon the Contract as though reproduced herein. Such reference shall mean the current edition, including all supplements. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

## PART 2 - SEQUENCE OF OPERATIONS

## 2.1 SCHEDULING

- A. 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 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.

B. 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 Owner. The CONTRACTOR shall have sufficient manpower, equipment, and material to complete the project. No work shall commence without express consent of the OWNER.

C. No Work Days – Holidays/Festivals

Date*	Event
July 4-5	Independence Day
August 30-Sep 1	Labor Day
Sep 18-21	Key West Poker Run
Oct. 19-26	Fantasy Fest
Nov. 7-9	Super Boat Races
Nov. 26-29	Thanksgiving
Dec. 5	Holiday Parade
Dec. 25-27	Christmas
Dec. 28-Jan 1	New Year’s Eve and Day
Jan. 20-25	Quantum Key West Race/Food and Wine
May 23-25	Memorial Day

Note: Exact calendar days vary from year to year; confirm dates with City a minimum of 4 weeks in advance.

2.2 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 OWNER.
- C. All contractors working on the site are subject to this requirement for cooperation and all shall abide by the OWNER’s decision in resolving project coordination problems without additional cost to the OWNER.

2.3 SHUTDOWN OF EXISTING OPERATIONS OR UTILITIES

- A. The CONTRACTOR's work shall not result in the interruption of sewage, water, or solid waste service to any customers.
- B. Connections to existing services or utilities, or other 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 OWNER or ENGINEER. Advance notice shall be given in order

that the OWNER or 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.

#### 2.4 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 system, except as specifically required by the Drawings and Specifications and after approval is granted by the OWNER. CONTRACTOR shall request approval 5 working days in advance of the time that interruption of the existing system is required. FKAA water valves can be operated only by FKAA personnel.

#### 2.5 PROGRESS OF CONSTRUCTION

- A. The work shall proceed in a systematic manner so that a minimum of inconvenience will result to the public in the course of construction. Backfill trenches so no section of properly laid pipe is left uncovered longer than is absolutely necessary. The safety conditions of open excavations shall be the CONTRACTOR's responsibility. Completely backfill and clean up after each section of pipe has been inspected and approved.
- B. Clean up construction debris, excess excavation, and excess materials immediately following the final backfilling.

### PART 3 - SITE CONDITIONS

#### 3.1 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, or similar physical conditions, the character of equipment and facilities needed 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.

### 3.2 INFORMATION ON SITE 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. Geotechnical data is provided in Appendix A.

### 3.3 UTILITIES

- A. The CONTRACTOR shall be responsible for determining, at his cost, the locations of all utilities shown identified on the 100% Construction Documents within the project area, and shall be responsible for contacting each utility for location and notification prior to commencing work.
- B. The contractor shall comply with The Underground Facility Damage Prevention and Safety Act, Chapter 556, Florida Statutes. Call the toll-free number, 811 and (800) 432-4770 for locates as it applies.

### 3.4 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 or ENGINEER nor their 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 OWNER, 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 OWNER.

### 3.5 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 OWNER 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.

### 3.6 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.

### 3.7 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 OWNER, 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.

3.8 PROTECTED VEGETATION

- A. Trees and shrubs are regulated and protected. 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

4.1 TEMPORARY WATER

- A. The CONTRACTOR shall make arrangements to obtain suitable water and shall pay all costs.

4.2 TEMPORARY ELECTRIC POWER

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

4.3 SAFETY REQUIREMENTS FOR TEMPORARY ELECTRIC POWER

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

4.4 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 OWNER.

4.5 STORAGE OF MATERIALS

- A. Materials shall be so stored 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

5.1 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 OWNER.

- 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.

## 5.2 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 OWNER.
- 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 OWNER, giving full details of the claim.

## 5.3 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.

## 5.4 TRAFFIC MAINTENANCE AND SAFETY

- A. Provide traffic maintenance plans to be approved by the City and the Engineer.
- 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.
- C. Where traffic will pass over trenches after they are backfilled and before they are paved, the top of the trench shall be maintained in a condition that will allow normal vehicular traffic to pass over. Temporary access driveways must be provided where required. Cleanup operations shall follow immediately behind backfilling and the worksite shall be kept in an orderly condition at all times.
- D. When signalmen and guards are required by regulation or when deemed necessary for safety, they shall be furnished with approved orange wearing apparel and other regulation traffic-control devices in accordance with FDOT provisions. Signalmen will be provided with "Stop and Go" paddles; flags are unacceptable.

#### 5.5 TRAFFIC CONTROL

- A. Traffic control on all city, county and state highway rights-of-way shall meet the requirements of the current edition (including all amendments) of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, as well as FDOT standard details for maintenance of traffic, in accordance with the Manual for Uniform Traffic Control and Safe Practices.
- B. The CONTRACTOR shall provide at no cost to the OWNER a Maintenance of Traffic Plan, including 11 x 17-inch engineered drawings of his intended maintenance of traffic scheme, to the agency having jurisdiction for review and approval. This shall include barrier details, barricade type, and location. Two copies of the plan with drawings shall be submitted to the OWNER and ENGINEER prior to initiation of construction.
- C. The CONTRACTOR shall maintain access to the Truman Navy Base, Fort Zachary Taylor Park, the Mole Pier, NOAA, and PAL building at all times.

#### 5.6 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.

#### 5.7 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.

#### 5.8 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.

#### 5.9 HURRICANE PREPAREDNESS PLAN

- A. Within 30 days of the date of Notice to Proceed, the CONTRACTOR shall submit to the City a Hurricane Preparedness Plan. The plan should outline the necessary measures which the CONTRACTOR proposes to perform at no additional cost to the OWNER in case of a hurricane warning.
- B. In the event of inclement weather, or whenever the City shall direct, CONTRACTOR will, and will cause Subcontractors to protect carefully the Work and materials against damage or injury from the weather. If, in the opinion of the City, any portion of Work or materials shall have been damaged or injured by reason of failure on the part of CONTRACTOR or any Subcontractors to so protect the Work, such Work and materials shall be removed and replaced at the expense of the CONTRACTOR.

### PART 6 - PRESERVATION, RESTORATION, AND CLEANUP

#### 6.1 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. Remove excavated materials daily; do not stockpile material 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. Replace top soil areas as specified raked and graded to conform to their original contours.
- C. All existing storm drainage systems shall be protected and shall properly drain. Restore storm existing systems culverts broken or damaged to their original condition and location as an incidental cost of construction.
- D. Upon completion of pipe laying and 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.

#### 6.2 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.

#### 6.3 STREET CLEANUP DURING CONSTRUCTION

- A. The contractor shall on a daily basis 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.

#### 6.4 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.

#### 6.5 PRESERVATION OF INLETS

- A. Existing inlets in the area shall be protected with appropriate best management practices and shall be periodically cleaned and kept free of siltation.

### PART 7 - SUBMITTALS DURING CONSTRUCTION

#### 7.1 GENERAL

- A. Requirements in this section are in addition to any specific requirements for submittals specified in other sections of these Contract Documents.
- B. The City is requesting that all supplied data collections, as built, drawings, and files to be compatible with esri ArcGIS 10.2.2 Software. As these are the solutions that work within its current computing environment. If there are any questions or concerns on whether your files meet this request, please contact the City GIS department at (305) 809-3721.

The current computing environment consists of:

- Microsoft SQL Server
- Windows 7/Server 2008
- ESRI GIS Platform

The City uses a number of software applications critical to its core operation and mission. The proposed mobile asset data collection solution will need to interface or integrate with these existing platforms.

- Arc Collector
- ArcGIS Online
- ArcMap 10.2

#### C. Shop Drawings:

1. Shop drawings, as defined herein, consist of all drawings, diagrams, illustrations, schedules, and other data as defined below which are specifically prepared by or for CONTRACTOR to illustrate some portion of the work; and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other information prepared by a manufacturer and submitted by Contract to illustrate material or equipment for distinct portions of the work.
2. Contents: Each of the shop drawing submittals shall be complete in all respects for equipment, controls, accessories, and associated appurtenances, and shall include, as a minimum, the following:

- a. Complete manufacturer's specifications, including materials, description, and paint system.
  - b. Required technical information, data, samples, and calculations that are required.
  - c. Required construction procedures and equipment that are required.
  - d. Requirements for storage and protection prior to installation.
  - e. A copy of the manufacturer's certification on all material installed, providing for the warranty period to commence on the date of final acceptance by the OWNER.
3. Submittal of incomplete or unchecked shop drawings will not be acceptable. Shop drawing submittals which do not clearly show CONTRACTOR's review stamp or specific written indication of CONTRACTOR's review will be returned to CONTRACTOR for resubmission.
  4. Submittal of shop drawings not required under these Contract Documents will be returned to CONTRACTOR unreviewed and unstamped by ENGINEER.
- D. The CONTRACTOR shall be responsible, at his own cost, for training the design consulting team in the use of submittal tracking software and/or web sites.

## 7.2 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 final payment can be made. Final record drawings shall be signed and sealed by a Professional Engineer and/or Surveyor currently licensed in the State of Florida. Record drawing file format shall be compatible with the City's GIS system.
- B. The CONTRACTOR shall keep the OWNER and ENGINEER apprised on a weekly basis, by providing Drawing mark-ups of the items that differ.

## 7.3 Additional Submittal requirements

- A. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the ENGINEER and at the Contractor's expense, based on the Engineer's then prevailing rates (minimum \$50.00 per additional review). The CONTRACTOR shall reimburse the OWNER for all such fees invoiced to the OWNER by the ENGINEER. Re-submittals are required until approved.
- B. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.

END OF SECTION 01 00 00

## SECTION 011000 – SUMMARY OF WORK

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Phased construction.
  - 4. Work by Owner.
  - 5. Work under separate contracts.
  - 6. Future work.
  - 7. Purchase contracts.
  - 8. Owner-furnished products.
  - 9. Contractor-furnished, Owner-installed products.
  - 10. Access to site.
  - 11. Coordination with occupants.
  - 12. Work restrictions.
  - 13. Specification and drawing conventions.
  - 14. Miscellaneous provisions.
  - 15. Owner Direct Purchase
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

## 1.3 PROJECT INFORMATION

- A. Project Identification: Truman Waterfront Park Phase 1A.

1. Project Location: At the western edge of the island of Key West, north of Naval Air Station Key West and Fort Zackary Taylor State Park and general west of Truman Annex Development
- B. Owner: The City of Key West.
  1. Owner's Representative: James Bouquet; 305-809-3962; [jbouquet@cityofkeywest-fl.gov](mailto:jbouquet@cityofkeywest-fl.gov)
- C. Prime Consultant/Project Manager: Bermello Ajamil & Partners, Inc.; Randy Hollingworth, 786-486-5269; [rhollingworth@bermelloajamil.com](mailto:rhollingworth@bermelloajamil.com).
- D. Prime Consultant/Landscape Architect: Bermello Ajamil & Partners, Inc.; Kirk J. Olney, RLA; 305-860-3709; [kolney@bermelloajamil.com](mailto:kolney@bermelloajamil.com)
- E. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
  1. Perez Engineering; Civil Engineering; Allen Perez; 305-293-9440; [aperez@perezeng.com](mailto:aperez@perezeng.com)
  2. Bermello Ajamil & Partners, Inc.; Architecture; Scott Bakos; 954-627-5109; [sbakos@bermelloajamil.com](mailto:sbakos@bermelloajamil.com)
  3. HGNS; Electrical and Plumbing; Tony Schulz; 305-270-9935 X217; [aschulz@hngsengineers.com](mailto:aschulz@hngsengineers.com)
  4. DDA Engineers; Structural Engineering; Pavel Gonzalez; 305-666-0711; [pgonzalez@ddaeng.com](mailto:pgonzalez@ddaeng.com)
  5. Aquadynamics; Aquatic Design & Engineering; John Wahler; 305-667-8975; [info@aquadynamics.biz](mailto:info@aquadynamics.biz)
  6. Environmental Engineering; E Sciences; Maria Paituvi; 954-484-8500; [mpaituvi@esciencesinc.com](mailto:mpaituvi@esciencesinc.com)
  7. TGA Design; Signage and Wayfinding; Cindy Reppert Ault; 305-669-2550; [cindy\\_ault@tgadesign.com](mailto:cindy_ault@tgadesign.com)
  8. Ken DiDonato, Inc.; Irrigation Design; Ken DiDonato; 954-923-2555; [kdirrconsult@aol.com](mailto:kdirrconsult@aol.com)

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
  1. The project consists of the management and disposal of encountered contaminated groundwater and soil, tree protection, tree relocation, site work, utility work, construction of roadways, parking lots, a restroom building, an interactive water feature, playgrounds and associated safety surface, shade sails, pedestrian paths, retaining walls, site lighting, landscape and irrigation.
- B. Type of Contract:
  1. Project will be constructed under a single prime contract.

## 1.5 PHASED CONSTRUCTION

- A. The Work shall be conducted in three (3) phases, designated as NTP's (Notice To Proceed), with each phase substantially complete as indicated in the Contract Documents:
1. NTP1: NTP1 consists of tree protection, tree relocation, demolition, management and disposal of contaminated groundwater and soil, utility work, earthwork and grading, drainage work including injection wells, curbing and asphalt paving, roadway and pedestrian lighting, concrete sidewalks, specialty roadway pavement, pavement marking, fencing, furniture, regulatory signage, manufacture and installation of wayfinding signage, landscape and irrigation. If selected by the Owner, NTP1 also may include Deduct Alternate 1.
  2. NTP2: NTP2 consists of tree protection, tree relocation, management and disposal of contaminated groundwater and soil, demolition, utility work, pedestrian lighting, earthwork and grading, drainage work, interactive water feature and associated specialty surfacing, construction of a restroom building, plumbing, shade canopies, flat and mounded rubberized safety surfacing, irrigation and palms within rubberized safety surface, curvilinear seat/retaining wall, playground equipment, concrete sidewalks, fencing, furniture, manufacture and installation of wayfinding signage, landscape and irrigation. Power washing east quay/promenade.
  3. NTP3: NTP3 consists of tree protection, tree relocation, management and disposal of contaminated groundwater and soil, demolition, utility work, earthwork and grading, drainage work including injection wells, roadway and pedestrian lighting, curbing and asphalt paving, concrete sidewalks, pavement marking, fencing, furniture, regulatory signage, manufacture and installation of wayfinding signage, landscape and irrigation. If selected by the Owner, NTP3 also may include Bid Alternates 1, 2 and 3.
- B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates for all phases of the Work.

## 1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
1. Remove equipment and material stored on site including portable barricades and aluminum ramp.

## 1.7 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine construction operations to “Limit of Work” as indicated on the drawings and in locations where infrastructure is being subbed out beyond the “Limit of Work” for future NTP’s, Phases or work.
  - 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving NOAA, Mole Pier, United States Navy and Fort Zackary Taylor clear and available to the public, and emergency vehicles at all times’ 24/7/365. Do not use these areas for parking or storage of materials.
    - a. Provide Maintenance of Traffic (MOT) Plan per Section 010000 “General Requirements.
    - b. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - c. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

#### 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work on the site to normal business working hours permitted by City of Key West Code Ordinances.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner, adjacent properties, facilities or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Notify Engineer and Owner not less than three (3) weeks in advance of proposed utility interruptions.
  - 2. Obtain Engineer's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Engineer and Owner not less than two (2) weeks in advance of proposed disruptive operations.
  - 2. Obtain Engineer's written permission before proceeding with disruptive operations.
- E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
  - 1. Maintain list of approved screened personnel with Owner's representative.

## 1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations commonly used and schedules on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

## 1.10 PROCEDURES FOR THE OWNER DIRECT PURCHASING (ODP) PROGRAM

- A. The City may at its option, institute an Owner Direct Purchasing (ODP) Program for the purchase other materials, which have been bid by the Contractor directly, as a cost saving measure directed at reducing the capital costs associated with construction of the Truman Waterfront Park. The Owner has prepared an ODP procedure, subject to the rules of the Florida Department of Revenue and other agencies having jurisdiction, for the use in this Program, which is presented below.
- B. Step 1: The City shall prepare a Purchase Requisition with the information received from the Contractor and appropriate Subcontractor and their supplier for material(s) or equipment which will be used in the construction of the Truman Waterfront Park Phase 1A. The minimum amount of the Purchase Requisition shall be five thousand U.S. Dollars (\$5,000). The Purchase Requisition shall include, in addition to the payment terms, a description of the material or equipment in the appropriate quantity/quantities, shipping, insurance, and invoice instructions.
- C. Step 2: Upon City approval of the Purchase Requisition, it will develop a Purchase Order for the vendor. The City shall forward a copy of said Purchase Order to the vendor with a required copy to the Contractor. The Contractor is responsible for forwarding a copy of the Purchase Order to the subcontractor with instructions for the subcontractor to contact the vendor and inform vendor that the Purchase Order has been processed and forwarded to the Contractor.

**Note: The City shall include its Tax Exempt Number on all Purchase Orders issued as part of the Owner Direct Purchase Program.**

- D. Step 3: The vendor shall ship the material or equipment to the project site or other designated location. The Contractor shall submit the original invoice received from the vendor and subcontractor to the City for approval along with a Conditional Release of Lien from the vendor. The City shall review the Purchase Order invoice with the Contractor to confirm delivery and to confirm material(s) and or supplies are not damaged or missing and that the materials and or supplies match the description of those materials and/or supplies included in the Purchase Order. Upon City's approval of the invoice, both parties shall sign the Material Equipment Verification and Confirmation Form for payment. If the Purchase Order invoice is rejected, City shall inform the Contractor, who shall inform the subcontractor and vendor.
- E. Step 4: Upon City's, Contractor's and subcontractor's approval of a Purchase Order, City will submit the Purchase Order invoice for payment. Payments made pursuant to any Purchase Order shall be pursuant to the Florida Prompt Payment Act.
- F. Step 5: At the end of each calendar month, Contractor will calculate the total sum of Purchase Orders issued by the City pursuant to this Owner Direct Purchase Program for the Truman Waterfront Park Phase 1A Project and submit to the City. City shall review this submittal prepare a deductive change order for the material(s)/equipment, including the sales tax saved and submit for review and execution.
- G. Step 6: Upon completion of the Truman Waterfront Park Phase 1A Project, the City will reconcile any differences between the total amount of all Purchase Orders issued pursuant to this Program for the Truman Waterfront Park Phase 1A project and the actual amount paid on said Purchase Orders. The net difference will be adjusted in a Change Order provided to the Owner.

#### 1.11 CHANGES TO AN OWNER DIRECT PURCHASE (ODP) PURCHASE ORDER

- A. If a change is required to an existing Purchase Order, Contractor shall fill out an Owner Direct Purchase Order Change Request Form. Included in said Change Request Form shall be a description of the reason for the change and the appropriate backup information from the vendor shall be attached. The Contractor shall submit the Request for review by the Owner.
- B. Owner, upon receipt and review of a Direct Purchase Order Change Request Form, may issue an amendment to the existing Purchase Order or void the original Purchase Order and issue a new Purchase Order for the increased or decreased amount.
- C. Contractor shall reconcile with City all adjustments to any existing Purchase Orders at the end of each calendar month as required pursuant to Step 5 above.
- D. Additional Comments regarding changes to Owner Direct Purchase:
  - 1. The sales tax savings realized pursuant to the Owner Direct Purchase Program shall be calculated as actual savings incurred through the ODP Program.
  - 2. Contractor shall prepare a Direct Purchase Order Summary Log, which will provide a list of all Purchase Orders issued pursuant to the ODP Program along with the amounts invoiced and paid to date for each Purchase Order. The Summary Log shall also include the amount of sales tax saved on each Purchase Order and shall indicate the number of change orders issued for each Purchase Order. Contractor shall be responsible for constant updates to the Summary Log and shall include a copy of the updated log in its Monthly Progress Report.

3. Contractor shall prepare a Vendor Direct Purchase Order Log for each vendor that has been issued a Purchase Order pursuant to this Program. The Log shall itemize each invoice submitted to Owner for payment, the amount Owner paid, and any change orders issued to vendor under each Purchase Order. This Log will be updated regularly and transmitted to Owner with each vendor invoice.
4. All original invoices must be mailed directly from the vendor/supplier to:

City of Key West  
Attn: Jim Bouquet - Engineering  
Post Office Box 1409  
Key West, FL 33041

5. All communication with the Owner regarding the Owner Direct Purchase Order Program must be directed to the same address.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012100 - ALLOWANCES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
  - 4. Contingency allowances.
  - 5. Testing and inspecting allowances.
- C. Related Requirements:
  - 1. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

## 1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

#### 1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders described in General Conditions.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

#### 1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

#### 1.8 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

#### 1.9 UNFORSEEN CONDITIONS ALLOWANCES

- A. The Unforeseen Conditions Allowance included in the approved budget amount is not a part of the Contractor's Contract and is set aside specifically to cover Field Change Directives that do not constitute a change in scope for the project or to be used as so determined by the City

#### 1.10 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

##### 3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Restroom Building Allowance: Include a contingency allowance of \$250,000.00 for use to construct an approximate 850 square feet CMU block and concrete round restroom building. Including associated sitework, utility connectors, foundations, finish and fixtures as shown in Architecture drawings.
  - 1. This allowance includes material cost, receiving, handling, and installation and Contractor overhead and profit.
  
- B. Contingency Allowance:
  - 1. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs

END OF SECTION 012100

## SECTION 012300 - ALTERNATES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

## 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

## 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or

deferred for later consideration. Include a complete description of negotiated revisions to alternates.

- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 SCHEDULE OF ALTERNATES

- A. Add Alternate No. 1: Saw Cutting Concrete
  - 1. Saw cut curvy edge along east side of Quay/pedestrian promenade (in NTP3; north to Building 103 as indicated on the drawings), remove /reuse demolished concrete, manage/dispose of contaminated groundwater and or soil, including those encountered during plant installation, and provide clean fill per the civil and landscape drawings and technical specifications.
- B. Add Alternate No. 2: Staining Concrete
  - 1. Provide materials, equipment and labor to apply stained concrete wavy pattern on walkways as shown on the Hardscape Paving and Finishes Plans and Details and technical specifications.
- C. Add Alternate No. 3: Construction of the Eaton Street Extension
  - 1. Provide material, equipment and labor to construction Eaton Street extension (from park boundary to the Building 103 Parking Lot) including excavation sub-base preparation, base, asphalt pavement and curbing as shown and detailed on the Civil Engineering Drawings and in technical specifications.
- D. Deduct Alternate No. 1: Eliminate Selective Trees and Irrigation
  - 1. Remove 29 Green Buttonwood trees, 2,040 square feet of St. Augustine sod, irrigation spray heads, bubblers and associated zone valves and piping and the addition of 2,040 square feet of Bahia sod between the southern entrance of NOAA and the traffic circle to the south as depicted on LL-01, LL-02, IM-01, IM-02 IB-01 and IB-02. Irrigation main shall still be installed as depicted on IM-01 and IM-02.

END OF SECTION 012300

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project Web site.
  - 5. Project meetings.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

## 1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
  3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and on Project Web site. Keep list current at all times.

#### 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See Section 017419 for disposition of salvaged materials that are designated as Owner's property.

#### 1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
  - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
  - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
  - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - e. Indicate required installation sequences.
  - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.

- b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
  - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
  - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  - e. Transformers:
  - f. Load Centers.
8. Fire-Protection System: Show the following:
- a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
  2. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    - b. Digital Data Software Program: Drawings are available in Auto CADD.
    - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

#### 1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect.

6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of Project Web site. Software log with not less than the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.

6. Date the RFI was submitted.
  7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

#### 1.8 PROJECT WEB SITE

- A. **Provide, administer, and use** Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
  2. Project correspondence.
  3. Meeting minutes.
  4. Contract modifications forms and logs.
  5. RFI forms and logs.
  6. Task and issue management.
  7. Photo documentation.
  8. Schedule and calendar management.
  9. Submittals forms and logs.
  10. Payment application forms.
  11. Drawing and specification document hosting, viewing, and updating.
  12. Online document collaboration.
  13. Reminder and tracking functions.
  14. Archiving functions.
- B. Provide up to sixteen Project Web site user licenses for use of the Owner, Architect, and Architect's consultants. Provide three hours of software training at Architect's office for Project Web site users.
- C. On completion of Project, provide one complete archive copy of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.
- D. Provide one of the following Project Web site software packages under their current published licensing agreements:
1. Autodesk, Buzzsaw.
  2. Autodesk, Constructware.
- E. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Architect.

#### 1.9 PROJECT MEETINGS

- A. General: **Schedule and conduct** meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 10 business days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.
    - l. Preparation of record documents.
    - m. Use of the premises and existing building.
    - n. Work restrictions.
    - o. Working hours.
    - p. Owner's occupancy requirements.
    - q. Responsibility for temporary facilities and controls.
    - r. Procedures for moisture and mold control.
    - s. Procedures for disruptions and shutdowns.
    - t. Construction waste management and recycling.
    - u. Parking availability.
    - v. Office, work, and storage areas.
    - w. Equipment deliveries and priorities.
    - x. First aid.
    - y. Security.
    - z. Progress cleaning.
  4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Owner's partial occupancy requirements.
    - k. Installation of Owner's furniture, fixtures, and equipment.
    - l. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.

- 10) Quality and work standards.
  - 11) Status of correction of deficient items.
  - 12) Field observations.
  - 13) Status of RFIs.
  - 14) Status of proposal requests.
  - 15) Pending changes.
  - 16) Status of Change Orders.
  - 17) Pending claims and disputes.
  - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:

- 1. Preconstruction photographs.
- 2. Preconstruction video recordings.
- 3. Aerial photographs.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For photographer.
- B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- C. Digital Aerial Photographs: Submit image files with each monthly pay application.
  - 1. Digital Camera: Minimum sensor resolution of 12 megapixels.
  - 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
  - 3. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- D. Video Recordings: Submit video recordings within seven days of recording.
  - 1. Submit video recordings in digital video disc format acceptable to Architect by posting to Project Web site or by posting to Web-based photographic documentation service provider's Web site.
  - 2. Identification: With each submittal, provide the following information:

- a. Name of Project.
- b. Name and address of photographer.
- c. Name of Architect.
- d. Name of Contractor.
- e. Date video recording was recorded.
- f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- g. Weather conditions at time of recording.

E. Aerial

- 1. Aerials from each direction (north, south, east and west)
- 2. Provide monthly with each pay application

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to Architect.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Periodic Construction Photographs: Take 4 aerial photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
    1. Vantage point of photographs shall be the same month to month.
  - E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
  - F. Final Completion Construction Photographs: Take 8 color aerial photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
    1. Do not include date stamp.
  - G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum or in the allowance for construction photographs.
    1. Three days' notice will be given, where feasible.
    2. In emergency situations, take additional photographs within 24 hours of request.
    3. Circumstances that could require additional photographs include, but are not limited to, the following:
      - a. Special events planned at Project site.
      - b. Immediate follow-up when on-site events result in construction damage or losses.
      - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
      - d. Substantial Completion of a major phase or component of the Work.
      - e. Extra record photographs at time of final acceptance.
      - f. Owner's request for special publicity photographs.
- 3.2 CONSTRUCTION VIDEO RECORDINGS
- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
  - B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
  - C. Preconstruction Video Recording: Before starting excavation, demolition and construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.

**8/19/2015**

**Truman Waterfront Park**

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition or construction.
4. Show protection efforts by Contractor.

END OF SECTION 013233

## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Section 013200 - Construction Progress Documentation for developing a schedule of required tests and inspections.
  - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

## 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and

completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equivalent, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the

minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.

## 1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.
  - 7. Entity responsible for performing tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- C. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. **Specialists:** Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed, unless otherwise indicated.
- J. **Laboratory Mockups:** Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 49.

## 1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 ACCEPTABLE TESTING AGENCIES

### 3.2 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

### 3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Comply with the Contract Document requirements for Section 017329-Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014523 - TESTING SERVICES

## PART 1- GENERAL

## 1.1 WORK INCLUDED

- A. The CONTRACTOR shall employ and pay for the services of a qualified commercial independent testing laboratory acceptable to the ENGINEER and the OWNER to perform specified services.
- B. Inspection, sampling, and testing is required for:
  - 1. Trench excavation and backfill.
  - 2. Paving and surfacing.
  - 3. Cast-in-place concrete.
- C. Employment of a testing laboratory shall in no way relieve the CONTRACTOR of his obligation to perform work in accordance with the Contract.
- D. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## 1.2 RELATED SECTIONS

- A. Section 01 40 00 – Quality Requirements

## PART 2- PRODUCTS

## 2.1 SUBMITTALS

- A. Submit six copies of reports of inspections and tests to ENGINEER promptly upon completion of inspections and tests, including:
  - 1. Date issued.

2. Project title and OWNER's job number.
  3. Testing laboratory name and address.
  4. Name and signature of inspector.
  5. Date of inspection or sampling.
  6. Record of temperature and weather.
  7. Date of test.
  8. Location of inspection or test.
  9. Identification of product and specification section.
  10. Type of inspection or test.
  11. Observations regarding compliance with the Contract Documents.
- B. This report shall be signed and sealed by a registered professional engineer licensed in the State of Florida, and qualified to perform such services.

PART 3- EXECUTION

3.1 LABORATORY DUTIES - LIMITATIONS OF AUTHORITY

- A. Cooperate with the OWNER and contractor; provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling, and testing of materials and methods of construction:
  1. Comply with specified standards; ASTM, other recognized standards, authorized and as specified.
  2. Ascertain compliance with requirements of Contract Documents.
- C. Notify the OWNER immediately of irregularities or deficiencies of work which are observed during performance of services. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by the OWNER.
- D. Submit copies of all test reports.
- E. Contractor shall cooperate with the testing personnel and provide access to the work.
- F. Contractor shall provide incidental labor and facilities for the testing personnel.

3.2 ON SITE TESTING

TESTING SERVICES

- A. On site testing must be performed by certified staff, by state approved agencies and must be approved by a Professional Engineer licensed in the State of Florida.

3.3 SUMMARY OF TESTING

Type	Frequency	Responsibility	Comments
Asphalt Density	2 per block	Contractor	As required by Engineer
Concrete	Every 72 CYDS	Contractor	Batch ticket has to be from Batch Computer machine
Trench Compaction Test	Per section 31 23 00	Contractor	
Sub base Compaction Test	Every 300 feet of roadwork	Contractor	
Base Compaction Test	One test per lift for every 300 feet of roadwork	Contractor	
Hydrostatic Test	Every new pipe and structure	Contractor	
Deflection Test	Every Pipe or as required by the Engineer	Contractor	Contractor to supply equipment for test
Lamping Test	Every Pipe or as required by the Engineer	Contractor with City Inspector	Contractor to supply equipment for test

- A. Testing and inspection of new gravity sanitary sewer pipe shall be in accordance with Section 33 31 13.
- B. Force mains shall be tested in accordance with AWWA Standard C600 latest revision.

A. Hydrostatic Tests:

1. After a new force main has been laid and backfilled, it shall be pumped to a pressure of 150 PSI and all visible leaks stopped by approved methods. During the test, the pressure cannot drop more than 5 PSI below the starting pressure point.
2. A leakage test shall then be conducted at the above mentioned pressure and no installation will be acceptable by the Engineer of Record until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = (S \times D \times P) \div 148000$$

in which L equals the allowable leakage in gallons per hour; S is the length of line in feet being tested; D is the nominal diameter of the pipe in inches; and P is the square root of the average test pressure during the leakage test in pounds per square inch. The test is usually maintained for two hours but it may be continued for one additional hour if it becomes apparent that the leakage is equal to or greater than the amount allowable. Water supplied to the main during the test to maintain the required

pressure shall be measured by a 5/8-inch meter installed on the discharge side of the test pump, or by pumping from a calibrated container. A hose bib connection will be provided to accept the test gauge supplied by WWS.

3. The section of main being tested shall be limited to a maximum length of 2000 feet. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed. Any questions pertaining to procedures used during the test shall be decided by WWS.

#### B. Cleaning and Flushing

Upon completion of the hydrostatic testing, all force main piping shall be flushed with a sufficient amount of clear water to displace test water. If the discharged water shows evidence of excessive mud, sand or other deposits, the Engineer of Record may direct the Contractor to continue flushing, or to clean the entire force main system by other approved methods to insure the removal of such deposits.

C. Water mains shall be tested in accordance with ANSI/AWWA Standard C600 latest revision.

#### A. Hydrostatic Tests:

1. After a new water main has been laid and backfilled, it shall be pumped to a pressure of 150 PSI and all visible leaks stopped by approved methods. During the test, the pressure cannot drop more than 5 PSI below the starting pressure point.

2. A leakage test shall then be conducted at the above mentioned pressure and no installation will be acceptable by the Engineer of Record until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = (S \times D \times P) \div 148000$$

in which L equals the allowable leakage in gallons per hour; S is the length of line in feet being tested; D is the nominal diameter of the pipe in inches; and P is the square root of the average test pressure during the leakage test in pounds per square inch. The test is usually maintained for two hours but it may be continued for one additional hour if it becomes apparent that the leakage is equal to or greater than the amount allowable. Water supplied to the main during the test to maintain the required pressure shall be measured by a 5/8-inch meter installed on the discharge side of the test pump, or by pumping from a calibrated container. A hose bib connection will be provided to accept the test gauge supplied by WWS.

3. The section of main being tested shall be limited to a maximum length of 2000. When testing against closed metal-seated mainline valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed. Any questions pertaining to procedures used during the test shall be decided WWS.

4. No allowable leakage shall be permitted for fire hydrants.

B. Bacteriological Tests (See Section 33 13 00):

1. After the water mains have satisfied the leakage requirements they shall be flushed through openings of the required size as detailed in ANSI/AWWA Standard C601 latest revision. The main shall then be sterilized in accordance with the provisions of the applicable sections of the above named specifications. On main breaks, cut-ins, etc., a liberal application of calcium hypochlorite shall be made; 50 PPM Chlorine during a 24 hour period.

2. Mains shall not be put into domestic service until the necessary bacteriological samples have been approved by the applicable regulatory agencies.

END OF SECTION 014523

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
  - 3. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

## 1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Contractor shall pay sanitary sewer pump out/disposal fee.
- C. Water Service: Contractor shall obtain temporary meter for water use and pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Contractor shall obtain temporary meter for electric use and pay electric-power-service use charges for electricity used by all entities for construction operations.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Prior to commencement of any work and or connection to or erection of temporary facilities, contractor shall provide to the Architect a site plan showing proposed location of temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
  - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

#### 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

#### 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Consider ease of corrections to utilities when siting construction trailers.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Chain-Link Fencing for Storage and Site Control: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide **concrete** bases for supporting posts.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Contractor Field Office Trailers: Of sufficient size to accommodate needs of Contractor. Separate office trailer for Contractor to accommodate Project meetings specified in other Division 01 Sections. Keep offices clean and orderly. Furnish and equip office trailer follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Engineer/Architect Field Office: Of sufficient size to accommodate needs of Owner and Architect. Separate office trailer for Owner and Architect. Furnish and equip office trailer follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
  - 3. Drinking water/water cooler and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
  - 7. High speed Internet connection and or Wi-Fi.

- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Cooling: Provide temporary cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Areas: Prevent dust, fumes, and odors from entering occupied areas.
  - 1. Perform daily construction cleanup and final cleanup using approved equipment.

- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service underground unless otherwise indicated.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  - 2. Install lighting for Project identification sign.
- I. Telephone Service: Provide temporary internet service in common-use facilities for use by all construction personnel. Provide download speed of not less than 50 Mbps.
  - 1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
  - 2. Provide superintendent with cellular telephone for use when away from field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
  - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Provide Maintenance of Traffic Plan (MOT) per Section 010000 "General Requirements".
- C. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations and public access to NOAA, Mole Pier, Navy, Fort Zackery Taylor and PAL Building.
  - 1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

- D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.
- E. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- F. Parking: Designated parking areas for construction personnel.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
  3. Contractor must comply with Groundwater and Soil Management Plan.
- H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Maintain Project identification signs located at Southard Street.
  2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project and access to adjacent uses.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  3. Maintain and touchup signs so they are legible at all times.
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Access to site shall be from Southard Street Entrance.

## 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Section 011000 "Summary."
  - 2. Comply with Contaminated Groundwater and Soil Management Plan (CGSMP).
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing" and Section 312500 "Erosion and Sedimentation Control".
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
  - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
  - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
  - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

END OF SECTION 015000

## SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
  - 2. Section 311100 "Cleaning and Grubbing" for removing existing trees and shrubs.

## 1.3 DEFINITIONS

- A. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches (1372 mm) above the ground line.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

## 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

- a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
  - b. Arborist's responsibilities.
  - c. Quality-control program.
  - d. Coordination of Work and equipment movement with the locations of protection zones.
  - e. Trenching by hand or with air spade within protection zones.
  - f. Field quality control.
  - g. Water requirements.
2. Review requirements of Soil and Groundwater Management Plan.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
  2. Detail fabrication and assembly of protection-zone fencing and signage.
  3. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
  1. Organic Mulch: 1-quart (1-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
  2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
  3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
  1. Species and size of tree.
  2. Location on site plan. Include unique identifier for each.
  3. Reason for pruning.
  4. Description of pruning to be performed.
  5. Description of maintenance following pruning.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

#### 1.7 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA and/or Registered Consulting Arborist as designated by ASCA.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

#### 1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Moving or parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry,

concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of one part stockpiled soil to one part planting soil.
  2. Planting Soil: Planting soil as indicated on drawings.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
1. Type: Organic mulch made from invasive tree species such as Melaleuca.
  2. Size Range: 2 inches (50 mm) maximum, 1/2 inch (13 mm) minimum.
  3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from maximum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts; with 0.177-inch- (4.5-mm-) diameter top tension wire and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
    - a. Height: 72 inches (1800 mm).
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
1. Size and Text: Existing tree: Do not disturb.
  2. Lettering: 3-inch- (75-mm-) high minimum, black characters on white background.
  3. Language: Sign shall be English and Spanish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

#### 3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain, Flag each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
  - 1. Apply 4-inch (100-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 12 inches (304 mm) of tree trunks.

### 3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
  - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
  - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 15 feet (4.5 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
  - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
  - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

### 3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist

condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

### 3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
  - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - 2. Cut Ends: Do not paint cut root ends.
  - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches (300 mm) inside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

### 3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches under direction of arborist.
  - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
  - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
  - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
    - a. Type of Pruning: thinning where indicated.
    - b. Specialty Pruning: Structural where indicated.
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Remove branches and dispose of off-site.

### 3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

### 3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

### 3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed pruning and repairs.
  - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
  - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 45 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  - 1. Large Trees: Provide Include caliper at 6 inch (150 mm) above grade of dead tree; in 12 inch minimum caliper trees.
    - a. Species: As approved by City Forester and Architect.
  - 2. Plant and maintain new trees as specified in Section 329300 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 3-inch (76-mm) uniform thickness to remain.

### 3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

## SECTION 017300 - EXECUTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

## 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor, registered in the State of Florida.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 15 working days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

## 1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

- a. Vehicular and pedestrian access to NOAA, Mole Pier, Navy, Fort Zackery Taylor and PAL Building.
  - b. Electrical Service to the Ingham.
3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to engineer, local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner before proceeding.
  2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  3. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  4. Proceed with patching after construction operations requiring cutting are complete.

- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- F. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

- G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
  - 1. Soil and Groundwater Management Plan
    - a. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous demolition and construction waste.
  - 2. Recycling nonhazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.
- B. For disposal of hazardous material see Soil and Groundwater Management Plan.

## 1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Structural and miscellaneous steel.
- g. Valves.
- h. Electrical conduit.
- i. Copper wiring.
- j. Switchgear and panelboards.
- k. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Metals.
- e. Piping.
- f. Electrical conduit.
- g. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.
  - 6) Wood crates.
  - 7) Plastic pails.

#### 1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
  2. Generation point of waste.
  3. Total quantity of waste in tons (tonnes).
  4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
  5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
  6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
  7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- 1.7 QUALITY ASSURANCE
- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- 1.8 WASTE MANAGEMENT PLAN
- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work.
- C. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
1. Total quantity of waste.

2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic district, by 12 inches (300 mm) or more.

### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
  1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Concrete: Pulverize and reuse as base material or fill.

C. Asphalt: Pulverize and reuse as base material or fill.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
  - a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 1/2-inch (13-mm) size.

1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312300 "Trench Excavation and Fill" for USCS Glass I Material.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum 1/4-inch (7-mm) size.
  - 2. Crush concrete and screen to comply with requirements in 312300 "Trench Excavation and Fill" for use as satisfactory soil for fill or subbase.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 1/2-inch (13-mm) size.
    - a. Crush masonry and screen to comply with requirements in Section 312300 "Trench Excavation and Fill" for use as general fill.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- I. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
    - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

## SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
  - 2. Section 017300 "Execution" for progress cleaning of Project site.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

## 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.
- D. Release of Lien or Claims

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by **Architect**. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain **Architect's** signature for receipt of submittals.
  - 5. Submit test/adjust/balance records.
  - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 15 working days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

#### 1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment per General Conditions
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Submit list of incomplete items in the following format:
    - a. PDF electronic file. Architect will return annotated file.

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Sweep concrete floors broom clean in unoccupied spaces.
    - h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - i. Remove labels that are not permanent.
    - j. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - k. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - l. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    - m. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired.

Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
  - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Injection wells.
  - 2. Interactive water feature
    - a. Nozzles
    - b. Pumps
    - c. Filtration systems
    - d. Ultraviolet systems
    - e. Grass
    - f. Chemical feed equipment
  - 3. Pebble Flex.
  - 4. Aqua Flex
  - 5. Kompan Play Equipment
  - 6. Shower
  - 7. Drinking Fountains
  - 8. Exercise Stations
  - 9. Furniture
  - 10. Pavers
  - 11. Irrigation.
    - a. Hoover Pump Stations
    - b. Rout Watering System emitters

## B. Related Requirements:

1. Section 116800 – Playfield Equipment and Structures
2. Section 129300 – Site Furnishing
3. Section 224713 – Drinking Fountains
4. Section 321400 – Unit Paving
5. Section 32 17 26 - Tactile Warning Surfacing
6. Section 32 18 16.10 - Interactive Water Feature Protective Surfacing
7. Section 32 18 16.13 - Playground Protective Surfacing
8. Section 32 84 00 - Irrigation System

## 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

## 1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.

7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components

of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If 11" x 17" drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in plastic sleeve with drawing title and sheet number exposed. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

### 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and

telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.

- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
  - 5. Requirements of Soil and Groundwater Management Plan.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

## 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

- b. Final Submittal:
  - 1) Submit six paper-copy set(s) of marked-up record prints.
  - 2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
  - 3) Print each drawing, whether or not changes and additional information were recorded.
  
- B. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding archive photographic documentation.
  
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Requirements of Supplemental Conditions.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  4. Refer instances of uncertainty to Architect for resolution.
  5. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
    - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
  2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.

- b. Date.
- c. Designation "PROJECT RECORD DRAWINGS."
- d. Name of Architect.
- e. Name of Contractor.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

## SECTION 017900 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training video recordings.
- B. Provide training for the following:
  - 1. Interactive water feature
  - 2. Irrigation pump systems
  - 3. Irrigation controller
  - 4. Irrigation water storage tank
  - 5. Lighting control devices
  - 6. Pebble Flex
  - 7. Aqua Flex
  - 8. Concrete pavers
  - 9. Injection drainage wells
  - 10. Landscape establishment and maintenance schedule

## 1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Date of video recording.
  2. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

#### 1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.

3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

### PART 2 - PRODUCTS

#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.

- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

#### 3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Owner will furnish personnel to describe Owner's operational philosophy.
  - 2. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

#### 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to .mp4 format file type or format file type acceptable to Owner, on electronic media.
1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
  2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
  3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
  4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.
- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

## SECTION 030131 - CONCRETE CLEANING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."
- C. Section 321373 "Concrete Paving Joint Sealants"

## 1.2 SUMMARY

- A. Section Includes :
  - 1. Concrete Cleaning.
  - 2. Concrete Power Washing.
  - 3. Minor Concrete Repairs.
- B. Contractor shall furnish all labor and equipment necessary to clean exterior concrete surfaces as depicted on the Drawings.

## 1.3 ACTION SUBMITTALS

- A. Contractor shall provide all equipment, labor and materials required to pressure wash concrete designated on the Drawings. The designated areas are to be cleaned in their entirety (not spot-cleaned).
- B. Contractor shall maintain comply with National Pollutant Discharge Elimination System (NPDES) and other local, state and federal laws, rules, regulations and requirements related to run off. Compliance includes the implementation of practical methods, known as Best Management Practices (BMPs) which shall be used to protect the environment and to comply with regulatory requirements.
- C. Provide all labor, materials and supervision required to pressure wash concrete sidewalks. CONTRACTOR shall assure that all work is performed in a professional manner and the final product is of a high quality.

- D. CONTRACTOR represents itself as possessing the necessary skills and qualifications to provide the services required and as being fully qualified to perform those services in accordance with the highest standards of CONTRACTOR'S profession.
- E. Provide, at no cost to the City, training to employees and subcontractors in the safe operation of equipment, safe application of any appropriate cleaning agents, disinfectants, and/or germicidal solutions, and training in all applicable storm water Best Management Practices (BMPs).

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For the following, from manufacturer:
  - 1. Cleaning agents
  - 2. Machinery
  - 3. Water pressure

#### 1.5 QUALITY ASSURANCE

- A. If power washing causes any damage to the existing concrete, stop operations immediately and report condition to Architect.

#### 1.6 FIELD CONDITIONS

- A. Furnish and maintain any and all warning devices (i.e. barricades, cones, signs, lights, etc.) required to adequately provide a safe working environment during the performance of the work.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT

- A. Furnish equipment capable of delivering high-pressure, hot water suitable for removing stains, spills, etc. from concrete without damaging the surface material. In addition, equipment shall be capable of absorbing all runoff from pressure washings to prevent said runoff from entering the storm drain system. The use of chemicals must be approved by the Architect. All pressure washing equipment is subject to Architect's approval.
- B. Maintain all equipment in good working order at all times, so that equipment is available upon call from the Architect to perform cleaning services.
- C. Furnish a self-contained power source for equipment.
- D. Use equipment with a noise retardant system that limits noise exposure to residents.
- A. Equipment must have hoses with sufficient length to be able to position power washing vehicles away from residential housing.

## 2.2 CLEANING AGENTS

- A. Maintain a supply of appropriate cleaning agents, disinfectants, and/or germicidal solutions as may be required.

## 2.3 WATER

- A. Contractor shall provide their own water and/or an approved metering device.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Carefully examine the work site, proposal forms, plans, specifications and special provisions for the work proposed. Acceptance of work shall be considered conclusive evidence that the Contractor has investigated and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and materials to be furnished, and as to the requirements of documents.

## 3.2 PREPARATION

- A. Remove loose material from surface.
- B. Report defoliated concrete to Architect.

## 3.3 RUNOFF

- A. Capture and dispose of all runoff in accordance with National Pollutant Discharge Elimination System (NPDES) Order No..

## 3.4 FIELD QUALITY CONTROL

- A. Contractor shall take special care to not affect damage or remove expansion joints. If a part of a joint is affected, the entire joint shall be replaced per "Section 321373 Concrete Paving Joint Sealants".
- B. Perform power washing in sections defined by the construction and control joints.
- C. Examine progress of work to verify a consistent and even appearance without streaks or evidence of power washing operations.
- D. Reexamine finish after concrete has been dry for 24 hours and verify an even appearance without streaks or evidence of power washing operations.

3.5 REPAIR AND PROTECTION

- A. Repair cracks in concrete wider than 1/10" of an inch.
- B. Repair defoliated concrete areas to a flush and even consistency.

END OF SECTION 03 01 31

## SECTION 033617 - EXTERIOR CONCRETE STAIN

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Groundwater and Soil Management Plan
  - 1. RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Saw cutting concrete joints
  - 2. Stained concrete finish
- B. Related Sections
  - 1. Section 030131 "Concrete Cleaning"
  - 2. Section 321313 "Concrete Paving" for general concrete applications.
  - 3. Section 321373 "Concrete Paving Joint Sealants" for colored sealant installed in existing paving joints.

## 1.3 SUBMITTALS

- A. Contractor shall submit specified manufacturer's complete technical data sheets for all products to be used, including installation instructions.
- B. Verification of VOC content.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
- D. Qualification Data: For manufacturer and Installer.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of specified stain and sealer shall have a minimum 10 years experience in the production of the specified products.

- B. Installer Qualifications: Contractor must have a minimum 5 years' experience in saw cutting and staining applications and successfully completed not less than 6 projects comparable in scale and complexity.
1. Statement of Contractor Qualifications
    - a. Submit list of at least 2 completed projects including project name, project address and owner contact information.
- C. Regulatory Requirements:
1. Products to comply with United States Clean Air Act for maximum Volatile Organic compound (VOC) content as specified in this Section.
- D. Material Source: Obtain each specified material from the same source.
- E. Notification: Give a minimum 14 calendar days' notice to manufacturer's authorized field representative before date established for commencement of concrete stain work.
- F. Mockups and Field Samples: Prepare field sample at project site for architects review and approval.
1. Construct a 10 foot by 10 foot mockup on East Quay/Promenade sections of sidewalk that is slated for demolition. If contractor demolishes East Quay prior to providing stained concrete mock ups, contractor shall be responsible and at no additional expense to the City, mock ups as specified and shall be responsible for removing them after review and approval.
  2. Provide individual mockups for five colors and pattern required.
  3. Provide mock ups for each color and include examples with one coat of stain and two coats of stain for a total of 10 mock ups.
  4. Construct sample-using processes and techniques intended for use on permanent work, including saw cutting and curing procedures. Include samples of control, construction, and expansion joints in sample panels.
  5. Sample shall be stained by the individual workers who will actually be performing the work for the project.
  6. Obtain the Architect's and Owner's acceptance of each mockup prior to commencement of the work.
  7. Retain approved samples through completion of the work for use as a quality standard for finished work.
  8. Notify Architect and Owner a minimum of fourteen calendar days in advance of the date scheduled for each mockup construction.
  9. Demolish and remove each mockup from site when directed.
- G. Saw Cuts
1. Provide four saw blade widths for Architect's approval.
- 1.5 DELIVERY, STORAGE AND HANDLING
- A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.

- B. Store specified products in conditions recommended by the manufacturer.
- C. Handle products according to manufacturer's printed instructions.

#### 1.6 JOB SITE CONDITIONS

- A. Environmental Conditions: Maintain an ambient temperature of between 50° F and 90° F during application and at least 48 hours after application.
- B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Concrete Stain: A semi-opaque pigmented solvent-based penetrating polysiloxane stain designed to add new color to uncolored concrete
- B. SCOFIELD® Revive™ Exterior Concrete Stain as manufactured by the L.M. SCOFIELD COMPANY, Douglasville, Georgia, OR APPROVED EQUAL, is considered to conform to the requirements of this specification.
  - 1. Colors: Colors to be specified by Architect off SCOFIELD® Revive™ Exterior Concrete Stain Color Chart CC-1710.01 or custom color.
- C. Substitutions: The use of any products other than those specified will be considered providing that the contractor requests its use in writing within fourteen (14) days prior to bid date. This request shall be accompanied by:
  - 1. A certificate of compliance from the material manufacturer stating that the proposed products meet or exceed the requirements for this specification.
  - 2. Documented proof that the proposed material has a ten (10) year proven record of performance for staining concrete substrates, confirmed by at least five (5) local South Florida projects that the Architect can examine.

### PART 3 - GENERAL

#### 3.1 EXAMINATION

- A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Newly placed concrete should be sufficiently cured, a minimum 28 days.

- B. Liquid curing materials shall not be used. Concrete flatwork should be cured with new and unwrinkled, non-staining, high quality curing paper.
- C. Immediately prior to staining, the concrete must be thoroughly cleaned according to Tech Data Bulletin TD-1770.11 Rev. 8.5.2015 for SCOFIELD® Revive™ Exterior Concrete Stain.

### 3.3 CONTROL JOINTS

- A. Layout wavy pattern, in chalk or other water soluble marking, as shown on Hardscape Paving and Finishes Plans.
- B. Architect to review and approve layout of wavy pattern prior to commencement of saw cutting.
- C. Saw cut ¼” deep joints between different color stains. Width to be as selected by Architect.

### 3.4 APPLICATION OF SCOFIELD® Revive™ Exterior Concrete Stain OR APPROVED EQUAL

- A. All concrete surfaces must be dry and properly prepared as described above. Surrounding areas must be protected from over-spray, run-off and tracking. The surface should be divided into small work sections using saw cut joint lines as breaks as natural stopping points.
- B. SCOFIELD® Revive™ Exterior Concrete Stain should be applied full strength (undiluted) at the coverage rate recommended by the manufacturer and using application equipment described in the manufacturer’s printed technical literature.
- C. The SCOFIELD® Revive™ Exterior Concrete Stain should be transferred to the substrate by spray and immediately scrubbed into the surface.
- D. The cure time depends on wind conditions, temperatures, and humidity levels.

### 3.5 MAINTENANCE

- A. Stained concrete surfaces should be maintained by sweeping. Spills should be cleaned when they occur and dirt rinsed off with water. Heavily soiled areas may be wet-cleaned by mopping or by scrubbing with a scrubbing brush and a suitable, high quality commercial detergent.

END OF SECTION 033617

## SECTION 101426 – POST AND PANEL/PYLON SIGNAGE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.”

## 1.2 GENERAL

- A. Provide all labor, materials and equipment necessary for a complete fabrication and installation of the work of this section.
- B. Provide signage in accordance with requirements of the Contract Documents as provided by TGA Design.
- C. Successful bidder (s) will be assigned to the City of Key West, hereafter referred to as the Client. Sign Contractor must perform as required by contract and coordinate all work, meeting all schedules. Sign Contractor representative required to coordinate all scheduling with Client and Designer (TGA Design). Sign Contractor is expected to cooperate fully with the Client, General Contractor, General Contractor’s Sub-consultants, Designer and all Architects and Landscape Architects to expedite and facilitate the prompt and accurate completion and installation of all signage elements. He shall coordinate with other contractors and suppliers of equipment and services for which the Owner may engage outside of his contract, as is reasonable to complete the scope of work.

## 1.3 SIGN ITEM NUMBERS AND CHARACTERISTICS

- A. Refer to Sign Location Plans and Sign Message Schedule as well as Design Documentation Drawings.

## 1.4 TIME OF COMPLETION

- A. As directed by Client, and confirmed in writing.

## 1.5 PRE-CONSTRUCTION CONFERENCE

- A. A preconstruction meeting will be held with Client, Architect, Landscape Architect, and Sign Contractor to establish final specifications, field working conditions, and proper channels for coordination; time and date of meeting to be determined.

## 1.6 REFERENCES

- A. National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual"
- B. American Welding Society  
  
AWS D1.1 "Structural Welding Code, Steel", and  
AWS D1.2 "Structural Welding Code, Aluminum"
- C. Underwriters Laboratories, Inc. (UL), Standards for Safety, UL Publication 48 "Electric Signs"

## 1.7 SUBMITTALS BY SIGN CONTRAC

- A. Submit Shop Drawings for approval by Client and Designer: Furnish elevations, details of fabrication and erection, including all materials, shapes, dimensions, finishes, design loads, anchorage, and method of connections. Show dimensions of letters and Logo forms.
- B. Samples: Fabricator must match all custom paint and materials as specified by Designer, and shall submit two (2) sets of non-returnable samples of each custom and standard color, material or finish as specified in these design documents, for review and approval by Client and Designer.
- C. Supplementary Product Literature: The Sign Contractor will furnish Client and Designer with Manufacturer's literature describing the general properties of each product to be used in the Work.
- D. Structural Calculations: Furnish engineering calculations to show that maximum stress and deflection of sign elements and sign support system do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by an Engineer licensed in the province where project is located. Calculations shall meet all local state and national codes including South Florida Hurricane codes. Signs shall be designed and engineered to withstand 150 mph wind loads.
- E. Specialty Engineered Items: Signage and associated components, footings and attachments are to be specialty engineered items. Contractor, as part of his bid and services, shall provide engineered structural design, per F.B.C., for material, attachments, and or installation of all signage.
- F. Extra Materials: Deliver extra materials to the Client in Manufacturer's original packing, including touch-up paint, lamps, hardware, installation materials, inserts, etc., as may be required.

## 1.8 PERMITS BY SIGN CONTRACTOR

Sign Contractor shall make all submittals for permits, shall be responsible for paying all fees, shall make adjustments as required, or perform any task necessary for obtaining local building and installation Sign Permits for the proper execution of the work. Sign Contractor shall coordinate all permits required with the various Governing Agencies.

## 1.9 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of International, National and Municipal authorities having jurisdiction. Obtain necessary approvals and permits for all such authorities.
- B. Markings and Labels: No labels or markings are to be used unless required by authorities per code. If necessary, locate markings and other identifications so as to be concealed from public view and as acceptable to Owner and Designer.
- C. Final Location of Signs: The exact final locations of sign elements shall be directed by Client and Designer and confirmed at the site. Sign Contractor shall arrange for meetings at the site to accommodate Client and Designer's direction of final locations
- D. General
  - 1. The Sign Contractor is responsible for hiring, compensating, and coordinating all subcontractors in the various trades which may be required to construct the Work. The Sign Contractor shall be responsible for the quality of all materials and workmanship of any firm or individual who acts as a subcontractor.

All work under this Contract shall be performed by skilled craftsmen, under the supervision of trained foremen, experienced in the trade or craft required to accomplish the Work and produce products of high quality. The Sign Contractor shall guarantee all materials and workmanship for an Owner specified period after date of acceptance of Work by Client and Designer.

- 2. Written dimensions on drawings shall have precedence over scaled dimensions. Sign Contractor shall field verify and be responsible for all dimensions and conditions shown by these drawings. Shop details must be approved by Client and Designer prior to fabrication.
- 3. Client and Designer shall be notified by Sign Contractor in writing of any discrepancies in drawings, infield dimensions or conditions and/or changes required in construction details.
- 4. Sign Contractor may not manufacture, reproduce, or exhibit these designs, or modify them for any other purpose outside of this current contract without written approval of Client and Designer.

## 1.10 WARRANTY

- A. Signage Warranty: Furnish a written warranty, as specified by Client, and signed by the Sign Contractor and Installer, agreeing to repair or replace Work which has failed as a result of defects in materials or workmanship. A minimum of a one (1) year warranty on sign components and seven (7) years for paint finishes is required. Sign Contractor is responsible to acquire any authorization necessary to provide Manufacturer's warranty for all materials. Upon notification of such defects within the warranty period, make necessary repairs or replacement at the convenience of the Client.

1.11 CODES, STANDARDS AND PUBLICATIONS REFERENCE

- A. Codes, standards and publications listed and referenced in these specifications form a part of these specifications. Except where otherwise indicated, the latest editions on the date of the Notice for Proposal shall be applicable.
- B. Contractor guarantees that at any time up to and including seven (7) years from the date of final acceptance by the Designer/Architect/Client, sign coatings will conform to these minimum performance characteristics.

Film Property	Method	Requirement
Weathering - Color Retention	ANSI/ASTM D-2244-68 “Method of Opaque Materials (Photometric Instrument Comparison With “Control” Sample	Maximum 5 E Units (Hunter) Color Change
OR		
Weathering Color Retention	ASTM “D-1535-68” Specifying Color by the NCS, Pantone, or RAL System (Visual Comparison With “Control” Sample)	Maximum Difference 0.5 Hue Step 0.1 Value Step 0.4 Chroma Step
Weathering - Gloss Retention	ASTM D-523-78 60 Degree Glossimeter	Maintain Gloss Minimum of 75 Degrees
Weathering - Chalk Resistance	ASTM D-659-74 “Evaluating Degree of Chalking Of Exterior Paints”	Minimum Rating of 6
Resistance to Acid/ Acid Pollutants	30 Minutes Exposure to 70% HN03 Vapors	Maximum 5 E Units (Hunter) Color Change
Direct Impact Resistance	Gardner Impact Tester 1/10” Distortion ASTM D-2794-69	No Chipping or Removal of Material
Abrasion Resistance	ASTM D0968-51 “Abrasion Resistance of Coatings of Paint, Varnish, Lacquer and Related Products by the Falling Sand Method”	40 Minimum

1.12 MAINTENANC

- A. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating, cleaning and maintaining the work. Include Manufacturer’s brochures and parts lists describing the actual materials used in the work, including metal alloys, finishes, and other major components. Assemble manuals for component parts into single binders, identified for each system.

## 1.13 ONSITE CONDITIONS

- A. By bidding, Sign Contractor acknowledges that he has visited the site and is familiar with the site and all conditions under which this work is to occur. After the contract is awarded to a bidder, it is mandatory for the selected bidder to visit site and verify each sign's location and architectural conditions. No exceptions will be allowed and the manufacturer is liable for any architectural encumbrance that prevents a sign from being installed or conditions of wall materials. This visit MUST take place prior to the commencement of manufacturing.
- B. Prior to any and all construction activities, the contractor is responsible for verifying if location of construction activities are subject to environmental land use controls (LUC).<sup>5</sup> Any and all encountered contaminated soil and or groundwater shall be handled per the "Soil and Groundwater Management Plan", dated February 13, 2015, included in the project manual. Contractor shall verify that LUC Construction Permit has been filed and approved for this work.

## PART 2 - PRODUCTS

## 2.1 SIGN MATERIALS

- A. All Specified Metals  
Aluminum shall be suitable for ornamental, architectural work. Surface finish shall be smooth, free of extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of the specific application.

Structural metal for concealed framing shall be of hot or cold rolled steel or structural aluminum as required to properly satisfy sign engineering specifications.

- B. Hardware/Hinges  
Provide and install all incidental hardware, (if required) necessary for the proper functioning of the signs, including but not restricted to materials and products covered in this section.

Provide 316 stainless steel for all hinged access panels. Provide pin tumbler locks for all access panels requiring locks. Provide stainless steel fasteners for assembling ferrous and nonferrous metals.

- C. Insulation  
Separate all ferrous and nonferrous metals with nonconductive gaskets to prevent electrolysis. In addition to gaskets, provide stainless steel fasteners for same case.

- D. Plexiglas or Acrylic Plastic  
Shall be continuous manufactured/extruded acrylic or UV polycarbonate Lexan, appropriate for interior or exterior applications, as required. All plastics shall be of uniform color, translucence and illumination, as supplied by Manufacturer. No visible seams are permitted. Minimum allowable thickness is 3mm thick, unless otherwise noted on drawings. All beveled edges, where noted, are to be cut at a 45° angle and polished.

## 2.2 FABRICATION OF SIGNS AND SUPPORTS

- A. Quantities and Extras

Sign Contractor to confirm all quantities of signs ordered with the Client, and quantities of all “extras” required.

B. General

Provide custom manufactured sign assemblies and components, completely fabricated and finished at factory, before delivery to site. Construct to accurate detail and dimensions as shown and as reviewed on shop drawings. Fit and assemble the Work at the shop to the greatest extent possible, and mark the components as required to facilitate assembly during installation. Exposed fasteners on finished faces will not be allowed, unless specifically indicated. Waviness or oil-canning of surfaces is not acceptable. Minimum material thickness is to be 3mm unless otherwise noted or accepted by Owner and Designer.

C. Lettering

Letterforms having rounded positive and negative corners or nicked, cut, or ragged edges are not acceptable. Align letterforms to maintain a baseline parallel to the sign format. Maintain margins as indicated on Drawings. Fabricator to utilize specified fonts, digitally produced. No hand cut lettering is allowed. Digital fonts WILL NOT be provided to sign fabricator.

D. Seams and Joints

Welded joints shall be ground, filled and finished flush and smooth with adjacent work. Such seams shall be invisible after final finish has been applied. Spot welded joints shall not be visible on exterior of signs after final finish has been applied. No gaps, light leaks, waves, or oil-canning will be permitted in Work.

E. Metal Signs and Supports

Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces.

1. Welding

Make welds continuous. Comply with American Welding Society, Aluminum Association, and Copper Development Association standards, or equivalent, for the type of metal. Provide the alloy and type required for strength, workability, compatibility and color match, after grinding smooth and finishing the fabricated product.

2. Fasteners

Provide tamper-proof bolts, nuts, screws, washers, anchors, and other devices required to complete the work. Use same basic metal alloy as the metal fastened, finished to match color and texture. Use Stainless Steel 300 Series Alloy where joining dissimilar materials, and weather seal. Use exposed fasteners only where indicated. Perform drilling and tapping at shop. Provide adhesive, sealant, and other necessary materials, as specified by Designer.

3. Dissimilar Materials

Where metal surfaces will be in contact with dissimilar materials, coat the surfaces with epoxy paint or provide other means of dielectric separation, as recommended by Manufacturer, to prevent galvanic corrosion. Separate all ferrous and non-ferrous metals with non-conductive gaskets. Provide stainless steel fasteners to secure ferrous to non-ferrous metals.

4. Hardware  
Provide all incidental hardware necessary for the proper functioning of signs. External hardware shall conform to the external appearance of the sign, and be tamperproof.

- F. Galvanizing  
Provide for steel components in exterior construction, where noted, to be galvanized. Complete the shop fabrication prior to application of the zinc coating. Remove mill scale and rust, clean, and pickle the units as required for proper pre-treatment of the surfaces.

### 2.3 SHOP APPLICATION OF SIGN FINISHES

- A. Paint Finishes  
Clean the surfaces as required for proper adhesion of coatings. Use 3M Company "Scotch Brite" pads with cleanser and water, and/or chemically treat as recommended by paint manufacturer to remove deleterious film or residue.

1. Primer  
Provide in strict accordance with paint manufacturer's recommendations as required for proper adhesion and application of finish.
2. Paint  
Provide pre treatment and primer in accordance with Manufacturer's recommendation. All paint to be "Imron" or equivalent.
3. Clear Imron Finish  
Provide pre-treatment, primer, and eggshell finish coatings of highest quality available in accordance with Manufacturer's recommendations.

### 2.4 ARTWORK

- A. Unless noted, assume that Designer will supply typical camera-ready artwork for each specialty sign.
- B. Sign Contractor is responsible for all additional camera-ready art. He shall produce artwork following the typical camera-ready examples utilizing all specified typefaces, symbols, and logotypes.
- C. Letter and word spacing shall follow the format established by camera-ready examples.
- D. All artwork and text to be produced by digital or mechanical means, to the standard of typical artwork provided.
- E. All artwork remains the property of the Designer and shall be returned to the Designer immediately after the completion of fabrication. Artwork shall be returned in the same condition that it was lent.

### 2.5 Application of Graphics

- A. Frisket Painting
  1. All message patterns and graphics specified to be frisket painted shall be painted from digital masks prepared from the details of the Design Documentation Drawings. All frisket painting shall be executed in such a manner that all edges and corners of finished letterforms are sharp,

true and clean. Letterforms, symbols, and borders with rounded positive or negative corners edge buildup, bleeding or spattering, etc. will not be acceptable. Hand-cut masks will not be accepted.

- 2. Contractor shall prepare each mask in one continuous piece to accommodate total message coverage, unbroken horizontally or vertically except where such breaks are indicated on the drawings.
- 3. Contractors shall order or mix paint for each color in sufficient quantity to assure consistent application on all signs specified in a given color, and to ensure adequate touch up paints for the Client.
- 4. Contractor shall apply all paints evenly without holes, scratches, orange peeling, etc., and allow surface to air dry for forty-eight (48) hours prior to the application of a clear coat masking film to protect these sign faces during shipping and erection.
- 5. Contractor shall frisket paint all specified messages to achieve the colors specified.
- 6. Contractors shall use paint of a type made for the surface material on which it is to be applied. The paints shall be the finest quality of heat moisture and fade-proof pigments. All colors shall be the colors specified by the Designer. No paint or lacquer that will fade, discolor or delaminate as a result of local environmental conditions or heat shall be used.

B. Computer-Cut Graphics

Use pressure sensitive, non-yellowing, non-peeling and weather-resistant vinyl adhesive letters or images computer-cut from high quality vinyl as manufactured by 3M Company, applied in proper manner with 3M application tape as specified. Use approved fonts and equipment as specified.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION

A. Verification of Conditions

Examine the areas to receive the Work and the conditions under which the Work would be performed. Sign Contractor shall notify Owner in writing of all conditions detrimental to the proper and timely completion of the Work. **IT IS THE RESPONSIBILITY OF EACH BIDDER TO ALLOW FOR EXTENSIVE FIELD VERIFICATION IN THEIR BIDS, PRIOR TO THE COMMENCEMENT OF THE MANUFACTURING PHASE.** Each sign location must be verified and scrutinized as to available space for installation and all conditions which could jeopardize a successful sign installation. The Designer will not be held responsible for errors of omission or sign/site conflicts.

B. Pre-Installation Meeting

A pre-installation meeting will be held with Owner, Designer and Sign Contractor to mutually agree on all installation details, placement, access, etc.

3.2 INSTALLATION OF SIGNS

A. General

Complete installation shall be in accordance with Manufacturer's printed instructions and accepted shop drawings, to produce Work complying with the Contract Documents. The Sign Contractor will be responsible for daily cleanup of their areas of Work.

B. Erection of Signs

Set and attach the Work accurately in location, alignment and elevation, plumb, level and true, as measured from established reference points and from other Work already in place. Fit components accurately together to form tight joints and secure connections. Coordinate with other trades as necessary, if applicable.

3.3 ADJUSTING

Neatly repair minor blemishes or marring on finished surfaces so that repairs are imperceptible. Completely replace components having permanent non-removable scratches, stains, or other defacement.

3.4 CLEANING/SITE REPAIR

Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site. Remove protective coverings and clean the exposed surfaces of the Work to remove dirt, stains and other substances, by methods as recommended by Manufacturer.

3.5 PROTECTION

Protect the Work during the construction period so that it will be without any indication of use of damage. Leave the Work clean and free from defects at time of Owner's acceptance.

3.6 FINAL WALKTHROUGH AND PUNCH LIST

A final walkthrough will be held with Owner and Designer to review the finished installation. Designer will prepare a punch list of all items requiring modifications. Owner and Designer reserve the right to reject all or part of a sign that does not correspond to Design Drawings and specifications or the approved shop drawings, lettering patterns, samples, etc.

3.7 GUARANTEE

Sign Contractor to provide full guarantee of all workmanship, materials, equipment, etc. of this installation for a period specified by Owner, after Owner acceptance. Sign Contractor shall replace/repair any defective work within a reasonable and agreed upon time period after notification by Owner, throughout the duration of this period. Sign Contractor shall execute the Warranty/Guarantee form supplied by Owner.

3.8 FABRICATION ERRORS

If the Sign Contractor has made an error in copy, color, material, quality, etc. these items must be corrected as soon as possible after Owner's observation of error (at no additional cost to the Owner). Owner will notify the Sign Contractor with a written punch list as errors are discovered.

3.9 SALVAGEABLE MATERIALS

Unless designated otherwise by the Contract Documents, all salvageable materials and equipment shall remain the property of the Client and will be set aside at an on-site location designated by the Client, Designer, or General Contractor. Materials and equipment not retained by the Client shall become the property of the Contractor and shall be removed from the site by the Contractor.

All debris shall be removed daily from the site by the Contractor and disposed of in a legal manner. No vending of materials is permitted on project site.

All materials suitable for recycling shall be recycled by the fabricator with documentation provided to the Client/Designer for their records and LEED documentation.

3.10 STORM PROTECTION

Should warning of winds of gale force or stronger be issued, the Contractor shall take every precaution to minimize danger to persons, to the Work, and to adjacent property. The precautions shall include, but not be limited to, removing all loose materials, tools, and equipment from exposed locations.

PART 4 – TYPICAL TYPEFACE

AG Book Stencil is the primary font used.

## SECTION 116800 - PLAY FIELD EQUIPMENT AND STRUCTURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes playground equipment as follows:
  - 1. Freestanding playground equipment.
  - 2. Composite playground equipment.

## 1.3 DEFINITIONS

- A. Definitions in ASTM F 1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of playground equipment.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."
- C. Samples for Initial Selection: For each type of exposed finish.
  - 1. Manufacturer's color charts.
  - 2. Include Samples of accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish on the following products:
  - 1. Include Samples of accessories to verify color and finish selection.
  - 2. Posts and Rails: Minimum 6 inches (150 mm) long.
  - 3. Platforms: Minimum 6 inches (150 mm) square.
  - 4. Molded Plastic: Minimum 3 inches (76 mm) square.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of playground equipment.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 ENGINEERING

- A. Contractor as part of Bid and Services shall provide engineered structural design per F.B.C. for attachments, foundations and complete installation.

## 2.2 MANUFACTURERS

- A. Source Limitations: Obtain playground equipment from single source from single manufacturer.
- B. Playground equipment and components shall have the IPEMA Certification Seal.

## 2.3 PERFORMANCE REQUIREMENTS

- A. Safety Standard: Provide playground equipment according to ASTM F 1487.

## 2.4 FREESTANDING PLAYGROUND EQUIPMENT

## A. Seesaw Ocean

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Kompan, Inc.

## B. Spinner Bowl: Freestanding, configuration.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Kompan, Inc.
- 2. Color: As selected by Architect from manufacturer's full range.

## C. Spica

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Kompan, Inc.
- 2. Colors: As selected by Architect from manufacturer's full range.

## D. Supernova.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Kompan, Inc.
- 2. Rotating Mechanism: Permanently sealed and lubricated ball bearings with hydraulic speed-limiting device.
- 3. Color: As selected by Architect from manufacturer's full range.

## 2.5 COMPOSITE PLAYGROUND EQUIPMENT

- A. Composite Play Structure: Explorer Dome, Flet 082614 Custom Element, ELE 4901126 Custom Element: Integral play assembly that provides more than one play activity; manufactured as a system or assembled from manufacturer's standard modular-sized units.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Kompan, Inc.
  2. Metal Frame: Galvanized-steel or Aluminum pipe or tubing connected with bolts.
    - a. Main Frame Posts: Not less than 6-inch (150-mm) OD.
    - b. Color: As selected by Architect from manufacturer's full range.
  3. Platforms: Manufacturer's standard.
    - a. Color: As selected by Architect from manufacturer's full range.
  4. Roofs: Manufacturer's standard.
    - a. Color: As selected by Architect from manufacturer's full range.
  5. Play Structure Access Component(s): Ladder, Stepladder, Stairs, Ramp, Accessible crawl ramp and Accessible transfer platform.
    - a. Handholds: Protective barriers, and Handholds on each side.
  6. Equipment: Include the following play event components:
    - a. Activity panel.
    - b. Balance beam.
    - c. Bridge.
    - d. Climber: Flexible net.
    - e. Log roll.
    - f. Slide.
    - g. Track ride.
    - h. Tunnel.
    - i. Colors: As selected by Architect from manufacturer's full range.
  7. Arrangement: As indicated on Drawings.
  8. Capacity:
    - a. Explorer Dome: 85 children
    - b. Flet Custom Element: 48 children
    - c. ELE 4901126 Custom Element: 45 children
  9. Age Appropriateness: Two through five years and five through 12 years.

## 2.6 FABRICATION

- A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F 1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structures, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required for equipment indicated.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as required. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- C. Play Surfaces: Manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from molded plastic made into floor units with slip-resistant finish. Fabricate units in modular sizes and shapes to form assembled play surfaces indicated.
- D. Protective Barriers: Fabricate according to ASTM F 1487. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from one of the following:
  - 1. Steel sheet with openings for vision and ventilation.
  - 2. Metal-pipe or -tubing frame with wire-mesh infill panels.
  - 3. Transparent plastic panels.
- E. Guardrails: Provide guardrails configured to completely surround the protected area, except for access openings. Fabricate from welded metal pipe or tubing. Extend guardrails according to requirements for use by age group indicated.
- F. Handrails: Welded metal pipe or tubing, maximum OD between 0.95 and 1.55 inches (24 and 39 mm).
  - 1. Provide handrails at heights to comply with requirements for use by age group indicated according to ASTM F 1487.
- G. Roofs and Canopies: Designed to discourage and minimize climbing by users.
  - 1. Fabricated from metal, clear polycarbonate plastic or polyethylene.
- H. Signs: Manufacturer's standard sign panels, fabricated from opaque plastic with graphics molded in, attached to freestanding, upright support posts or directly to playground equipment.
  - 1. Text: Minimum informational content according to ASTM F 1487.
  - 2. Colors: Manufacturer's designation.

## 2.7 MATERIALS

- A. Aluminum: Material, alloy, and temper recommended by manufacturer for type of use and finish indicated.
- B. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated, hot-dip galvanized.
- C. Stainless-Steel Sheet: Type 304; finished on exposed faces with No. 2B finish.
- D. Opaque Plastics: Color impregnated, UV stabilized, and mold resistant.
- E. Transparent Plastic: Abrasion-resistant, UV-stabilized polycarbonate sheet; clear, colorless; not less than 3/16 inch (5 mm) thick.
- F. Suspension Cable: Manufacturer's standard hot-dip galvanized or PVC-coated cable; with commercial-quality, hot-dip galvanized steel connectors and swing or ring hangers.
- G. Iron Castings and Hangers: Malleable iron, ASTM A 47/A 47M, Grade 32510, hot-dip galvanized.
- H. Post Caps: Cast aluminum; color to match posts.
- I. Platform Clamps and Hangers: Stainless Steel.
- J. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.
- K. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

## 2.8 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight concrete with minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (76-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.
- B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C 387/C 387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (76-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.
- C. As required by manufacturer.

## 2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm) medium gloss. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 80 mils (2 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

#### 2.10 IRON AND STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for pretreatment, applying, and baking.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 100 mils (2.5 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

#### 2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
  - 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
  - 1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set with Concrete Footing.

1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
  - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
3. Finishing Footings: Smooth top, and shape to shed water.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
  1. Perform inspection and testing for each type of installed playground equipment according to ASTM F 1487.
- C. Playground equipment items will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Notify Owner 48 hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 116800

## SECTION 129300 - SITE FURNISHINGS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Seating.
  - 2. Tables.
  - 3. Bicycle racks.
  - 4. Trash receptacles.
  - 5. Recycle receptacles.
  - 6. Bollards.
- B. Related Requirements:
  - 1. Section 321313 "Concrete Paving" for installing pipe sleeves cast and installing anchor bolts cast in concrete footings.
  - 2. Section 312300 "Excavation and Fill" for excavation for installing concrete footings.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Trash Receptacle Inner Containers: Five full-size units for each size indicated.

## PART 2 - PRODUCTS

## 2.1 BENCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Landscape Forms.
  - 2. Forms + Surfaces.
- B. Frame: Cast aluminum and Melostone Ultra High Performance Concrete.
- C. Seat and Back:
  - 1. Material:
    - a. Melostone Ultra High Performance Concrete.
  - 2. Seat Height: As indicated.
  - 3. Seat Surface Shape: Flat.
  - 4. Overall Height: As indicated.
  - 5. Overall Width: As indicated.
  - 6. Overall Depth: As indicated.
  - 7. Arms: Three, one at each end and in center.
    - a. Arm Material: Match frame.
- D. Aluminum Finish: Color coated.
  - 1. Color: As selected by Architect from manufacturer's full range.
- E. Stainless-Steel Finish: Provide sample to Architect for approval.

## 2.2 PICNIC TABLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Forms+Surfaces.
  - 2. Landscape Forms
- B. Frame: Cast aluminum.
- C. Table Top and Seat:

1. Material:
  - a. Aluminum.
2. Surface Shape: Shape indicated.

D. Aluminum Finish: Color coated.

1. Color: As selected by Architect from manufacturer's full range.

### 2.3 EMERSON BICYCLE RACKS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Landscape Forms.
2. Forms and Surfaces

B. Bicycle Rack Construction:

1. Frame: Aluminum.
2. Style: Double-side parking.
  - a. Overall Height: As indicated.
  - b. Overall Width: As indicated.
  - c. Overall Depth: As indicated.
  - d. Capacity: Designed to accommodate no fewer than two bicycles.
3. Installation Method: Surface flange anchored at finished grade to substrate indicated.

C. Aluminum Finish: Color coated.

1. Color: As selected by Architect from manufacturer's full range.

D. Stainless-Steel Finish: No. 4.

### 2.4 POE TRASH RECEPTACLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Forms+Surfaces.
2. Landscape Forms.

B. Aluminum Facing Surrounds: Evenly patterned, parallel flat aluminum straps, bars, or tubular shapes.

C. Support Frames: Galvanized steel; welded.

D. Trash Receptacles:

1. Shape and Form: Round cylinder with opening for depositing trash in receptacle side.
2. Receptacle Height: As indicated.
3. Overall Width: As indicated.
4. Inner Container: Black Polyethylene.
5. Capacity: Not less than 32 gal. (121 L).
6. Service Access: Fixed lid or top, side access; inner container slide-out for emptying; keyed lock with two keys per receptacle.
7. Post Mount: Color-coated steel pipe; color to match receptacle; for mounting one receptacle.

E. Aluminum Finish: Color coated.

1. Color: As selected by Architect from manufacturer's full range.

F. Stainless-Steel Finish: No. 6.

G. Graphics: Surface-applied copy, content, and style according to manufacturer's standard.

1. Copy: Litter.

## 2.5 POE RECYCLE RECEPTALE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Forms+Surfaces.
2. Landscape Forms.

B. Aluminum Facing Surrounds: Evenly patterned, parallel flat aluminum straps, bars, or tubular shapes.

C. Support Frames: Galvanized steel; welded.

D. Trash Receptacles:

1. Shape and Form: Round cylinder with opening for depositing trash in receptacle side.
2. Receptacle Height: As indicated.
3. Overall Width: As indicated.
4. Inner Container: Black Polyethylene.
5. Capacity: Not less than 32 gal. (121 L).
6. Service Access: Fixed lid or top, side access; inner container slide-out for emptying; keyed lock with two keys per receptacle.
7. Post Mount: Color-coated steel pipe; color to match receptacle; for mounting one receptacle.

E. Aluminum Finish: Color coated.

1. Color: As selected by Architect from manufacturer's full range.

F. Stainless-Steel Finish: No. 6.

- G. Graphics: Surface-applied copy, content, and style according to manufacturer's standard.
  - 1. Copy: Recycle.

## 2.6 ANNAPOLIS BOLLARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Urban Accessories, Inc.
  - 2. Landscape Forms
- B. Bollard Construction:
  - 1. Pipe and Cast Iron OD: Not less than 6 inches (152.4 mm).
    - a. Steel: Schedule 40 pipe.
  - 2. Style: Manufacturer's standard.
  - 3. Overall Height: As indicated>.
  - 4. Overall Width: As indicated
  - 5. Overall Depth: As indicated
  - 6. Installation Method: Removable
- C. Aluminum Finish: Color coated.
  - 1. Color: As selected by Architect from manufacturer's full range.
- D. Steel Finish: Color coated.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.7 ADA FOOT AND SHOWER TOWER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Haws
  - 2. Most dependable fountain
- B. Stainless Steel.
- C. Surface Mount
- D. Drainage per drawings

## 2.8 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
  - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).

2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Structural Pipe and Tube: ASTM B 429/B 429M.
4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
5. Castings: ASTM B 26/B 26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513/A 513M, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
7. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

C. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

D. Anchors, Fasteners, Fittings, and Hardware: Stainless steel, Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.

1. Removable type bollard.

E. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

## 2.9 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWP A M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

#### 2.10 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

#### 2.11 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

#### 2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

#### 2.13 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run directional finishes with long dimension of each piece.
  - 2. Directional Satin Finish: No. 4.
  - 3. Dull Satin Finish: No. 6.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 129300

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Sleeves.
  - 5. Grout.
  - 6. Equipment installation requirements common to equipment sections.
  - 7. Painting and finishing.
  - 8. Concrete bases.
  - 9. Supports and anchorages.

### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.

2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

#### 1.4 RELATED DOCUMENTS

##### A. Contaminated Groundwater and Soil Management Plan

Prior to any and all construction activities, the contractor is responsible for verifying if location of construction activities are subject to environmental land use controls (LUC). Any and all encountered contaminated soil and or groundwater shall be handled per the "soil and ground water management plan", dated February 13, 2015 included in the project manual. Contractor shall verify that LUC construction permit has been filed and approved for this work.

#### SUBMITTALS

##### B. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheons.

#### 1.5 QUALITY ASSURANCE

##### A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

##### B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Panels."

## PART 2 - PRODUCTS

### 2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
  - 1. CPVC Piping: ASTM F 493.
  - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

### 2.3 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
- B. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

### 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe: ASTM D 1785, Schedule 40.
- E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing. .
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.

- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- J. Verify final equipment locations for roughing-in.
- K. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  4. PVC Nonpressure Piping: Join according to ASTM D 2855.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- B. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- C. Install equipment to allow right of way for piping installed at required slope.

### 3.5 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Section "Painting and Coating"
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. As specified in Division 03 Section.

### 3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.8 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 220500

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Bronze ball valves.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 3. ASME B16.18 for solder-joint connections.
  - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
  - 2. Handlever: For quarter-turn valves smaller than NPS 4.

## 2.2 BRONZE BALL VALVES

- A. One-Piece, Bronze Ball Valves:
  - 1. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 400 psig.
    - c. Body Design: One piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Bronze.
    - h. Ball: Chrome-plated brass.
    - i. Port: Reduced.

## PART 3 - EXECUTION

### 3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

### 3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
  - 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

### 3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.

2. One piece, brass ball valve.
3. One piece, bronze ball valve with bronze trim.
4. Two-piece, brass ball valves with regular port and brass trim.
5. Two-piece, bronze ball valves with regular port and bronze or brass trim.

END OF SECTION 220523.12

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Bronze swing check valves.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 4. ASME B16.18 for solder joint.
  - 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
  - 1. Description:
    - a. Standard: MSS SP-80, Type 3.
    - b. CWP Rating: 200 psig.
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded or soldered. See valve schedule articles.
    - f. Disc: Bronze.

## PART 3 - EXECUTION

### 3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

### 3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. End Connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
  - 3. For Steel Piping, NPS 2 and Smaller: Threaded.
  - 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125, bronze disc with soldered end connections.
- B. Pipe NPS 2-1/2 and Larger:
  - 1. Iron swing check valves, Class 125, metal seats with flanged end connections.
  - 2. Iron swing check valves with closure control, Class 125, lever and spring or weight with flanged end connections.

END OF SECTION 220523.14

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

### 1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

### 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type L water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper Push-on-Joint Fittings:

1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

## 2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

## 2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Standard: ASSE 1079.
  - 2. Pressure Rating: 125 psig minimum at 180 deg F.
  - 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Standard: ASSE 1079.
  - 2. Factory-fabricated, bolted, companion-flange assembly.
  - 3. Pressure Rating: 125 psig minimum at 180 deg F.
  - 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
  - 1. Nonconducting materials for field assembly of companion flanges.
  - 2. Pressure Rating: 150 psig.
  - 3. Gasket: Neoprene or phenolic.
  - 4. Bolt Sleeves: Phenolic or polyethylene.
  - 5. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
  - 1. Standard: IAPMO PS 66.
  - 2. Electroplated steel nipple complying with ASTM F 1545.
  - 3. Pressure Rating and Temperature: 300 psig at 225 deg F.
  - 4. End Connections: Male threaded or grooved.
  - 5. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Comply with requirements in Section 312300 "Excavation and Fill" for excavating, trenching, and backfilling.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install shutoff valve immediately upstream of each dielectric fitting.
- C. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping to permit valve servicing.
- F. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
  - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

### 3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
  - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
    - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
  - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
  - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
  - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.8 ADJUSTING

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibs.
  - 2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
  - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.9 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

## 3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-ground, domestic water, building-service piping, NPS 2 and smaller, shall be one of the following:
  - 1. Soft copper tube, ASTM B 88, Type L; joints.
- E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
  - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
  - 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

END OF SECTION 221116

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Hose bibbs.
4. Water-hammer arresters.

B. Related Requirements:

1. Section 224713 "Drinking Fountains" for water filters for water coolers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

## 2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. AS indicated on drawings
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.

## 2.5 HOSE BIBBS

A. Hose Bibbs :

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.6 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters:
  - 1. Standard: ASSE 1010 or PDI-WH 201.
  - 2. Type: Copper tube with piston.
  - 3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  - 1. Locate backflow preventers in same room as connected equipment or system.
  - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
  - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install water-hammer arresters in water piping according to PDI-WH 201.

### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

## PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

### 1.2 PERFORMANCE REQUIREMENTS

- #### A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

### 1.3 ACTION SUBMITTALS

- #### A. Product Data: For each type of product indicated.

### 1.4 INFORMATIONAL SUBMITTALS

- #### A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

- #### B. Field quality-control reports.

### 1.5 QUALITY ASSURANCE

- #### A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- #### B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

## 2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

## PART 3 - EXECUTION

## 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312300 "Excavation and Fill."

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping at indicated slopes.
- C. Install piping free of sags and bends.
- D. Install fittings for changes in direction and branch connections.
- E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- G. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Sanitary Drain: 1/4" per foot downward in direction of flow for piping NPS 2 and smaller; 1/8" per foot downward in direction of flow for piping NPS 2 1/2" and larger.
  - 2. Vent Piping: 1/8" per foot down toward vertical fixture vent or toward vent stack.
- H. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- I. Install aboveground PVC piping according to ASTM D 2665.
- J. Install underground PVC piping according to ASTM D 2321.
- K. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping
  - 2. Install drains in sanitary drainage gravity-flow piping.

- L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
- F. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system

and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.7 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

### 3.8 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 6 and smaller shall be the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- C. Underground, soil, waste, and vent piping NPS 6 and smaller shall be the following:
  1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

## SECTION 224713 - DRINKING FOUNTAINS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes drinking fountains and related components.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountain.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include operating characteristics, and furnished specialties and accessories.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For drinking fountains to include in maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 DRINKING FOUNTAINS

- A. Drinking Fountains: Painted stainless steel or steel, wheelchair accessible.
  - 1. Stainless Steel or Steel Drinking Fountains:
    - a. Products: Subject to compliance with requirements, products indicated on Drawings or comparable products by one of the following:
      - 1) Haws Corporation;.
      - 2) Most Dependable Fountains, Inc.

2. Standards: Comply with ICC A117.1 and NSF 61 Annex G.
3. Pedestal: Round, with side receptor(s).
4. Receptor(s):
  - a. Number: Two
  - b. Material: Bronze or Chrome-plated brass or stainless steel.
  - c. Shape: Round.
  - d. Bubbler: One for each receptor, with adjustable stream regulator.
  - e. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
5. Controls: Push button.
6. Access to Internal Components: Panel in pedestal.
7. Supply Piping: NPS 1/2 (DN 15) with shutoff valve.
8. Drain Piping: NPS 1-1/2 (DN 40) minimum trap and waste.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Provide drainage as noted on the drawings.
- B. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- C. Set pedestal drinking fountains on floor.
- D. Install recessed drinking fountains secured to wood blocking in wall construction.
- E. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- F. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.14 "Check Valves for Plumbing Piping."

#### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

- C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.14 "Check Valves for Plumbing Piping."

3.4 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

- A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224713

SECTION - 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 RELATED DOCUMENTS

- A. Contaminated Groundwater and Soil Management Plan
  - 1. Prior to any and all construction activities, the contractor is responsible for verifying if location of construction activities are subject to environmental land use controls (LUC). Any and all encountered contaminated soil and or groundwater shall be handled per the “soil and ground water management plan”, dated February 13, 2015 included in the project manual. Contractor shall verify that LUC construction permit has been filed and approved for this work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Erico
- B. Burndy

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

## 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
  1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  3. Connections to Ground Rods at Test Wells: CAD-WELD connectors.
  4. Connections to Structural Steel: Welded connectors.

### 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

### 3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260533 "Raceways and Boxes for Electrical Systems," and shall be at least 12 inches deep, with cover.
1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.
8. Freestanding weatherproof panel enclosure

## B. Related Requirements:

1. Section 260526 "Grounding and Bonding for Electrical Systems"

## 1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
  1. Structural members in paths of conduit groups with common supports.
  2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

## PART 2 - PRODUCTS

## 2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - 1. Comply with NEMA RN 1.
  - 2. Coating Thickness: 0.040 inch, minimum.
- D. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: Comply with UL 514B.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

## 2.4 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.

## 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Device Box Dimensions 4 inches by 2-1/8 inches by 2-1/8 inches deep.

## 2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
  - 1. Standard: Comply with SCTE 77.
  - 2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 5. Cover Legend: Molded lettering, "ELECTRIC."

## 2.7 FREESTANDING WEATHER PROOF PANEL ENCLOSURE

- A. Freestanding NEMA 4X 316 stainless steel enclosure with 12" factory welded legs shall be equal to HOFFMAN WS603616FS(316SS) with welded AFK1216006 Legs.

Enclosure to be bolted down with stainless steel bolts to cast in place 6" concrete housekeeping slab with 4" overlap of pad. Concrete pad to be 48"x 24" width. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in 33 16 00 Sidewalks, Curbs and Gutters.

## PART 3 - EXECUTION

## 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
  - 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

## 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- D. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Support conduit within 12 inches of enclosures to which attached.

- G. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
  2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
  4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- M. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
  2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where an underground service raceway enters a building or structure.
  2. Where otherwise required by NFPA 70.
- P. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

- Q. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- S. Locate boxes so that cover or plate will not span different building finishes.
- T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

#### A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
  - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, below grade.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

## 1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## PART 2 - PRODUCTS

## 2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  1. Black letters on an orange field.

- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
  - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
  - 2. Inscriptions for Red-Colored Tapes: **ELECTRIC LINE, HIGH VOLTAGE.**
  - 3. Inscriptions for Orange-Colored Tapes: **TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.**
- C. Tag: Type ID:
  - 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
  - 2. Overall Thickness: 5 mils.
  - 3. Foil Core Thickness: 0.35 mil.
  - 4. Weight: 28 lb/1000 sq. ft..
  - 5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

## 2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
  - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
  - 2. 1/4-inch grommets in corners for mounting.
  - 3. Nominal size, 7 by 10 inches.
- D. Metal-Backed, Butyrate Warning Signs:
  - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
  - 2. 1/4-inch grommets in corners for mounting.
  - 3. Nominal size, 10 by 14 inches.

## 2.5 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

## 2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

### 3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.

- 3) Phase C: Blue.
- c. Colors for 480/240-V Circuits:
    - 1) Phase A: Brown.
    - 2) Phase B: Orange.
    - 3) Phase C: Yellow.
  - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
  - C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
  - D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
    1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
    2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
    3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
  - E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
    1. Limit use of underground-line warning tape to direct-buried cables.
    2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
  - F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
  - G. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
  - H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
  - a. Outdoor Equipment: Engraved, laminated acrylic.
  - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

END OF SECTION 260553

## SECTION 260923 - LIGHTING CONTROL DEVICES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Time switches.
  - 2. Photoelectric switches.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data

## PART 2 - PRODUCTS

## 2.1 TIME SWITCHES

- A. Copper.
- B. Intermatic.
- C. Electromechanical-Dial Time Switches: Comply with UL 917.
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Contact Configuration: SPST.
  - 3. Contact Rating: 30-A, 120V & 30A, 240V.
  - 4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
  - 5. Astronomic time dial.
  - 6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
  - 7. Skip-a-day mode.
  - 8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Copper.
- B. Intermatic.

2.3 LIGHTING CONTACTORS

- A. Siemens.
- B. Square D.
- C. G.E.
- D. Description: Electrically operated and mechanically held, combination-type lighting contactors, complying with NEMA ICS 2 and UL 508.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 260923

## SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Lighting and appliance branch-circuit panelboards.

## 1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
  - 8. Key interlock scheme drawing and sequence of operations.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## 1.6 FIELD CONDITIONS

- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

## 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Surface-mounted, dead-front cabinets.
  1. Rated for environmental conditions at installed location.
  2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- E. Incoming Mains Location: Bottom.
- F. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
  1. Material: Tin-aluminum.
  2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- H. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Siemens.
- B. Square D.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Siemens.
- B. Square D.
  - a. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  - 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

## 2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## 2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407 NEMA PB 1.1.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- I. Install filler plates in unused spaces.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Leviton.
- B. Legrand.
- C. Hubbell.

- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

## 2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.

## 2.3 GFCI RECEPTACLES

- A. General Description:
  - 1. Straight blade.
  - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.4 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.

## 2.5 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail, or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

C. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Adjust locations of service poles to suit arrangement of partitions and furnishings.

## 2.6 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles.

## 2.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

## SECTION 265600 – EXTERIOR LIGHTING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Exterior luminaires with lamps and ballasts..
2. Poles and accessories.

## 1.2 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.
- C. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

## 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements.

## 2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
  - 1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
  - 2. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
  - L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
  - M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
    2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      - a. Color: As selected from manufacturer's standard catalog of colors.
  - N. Factory-Applied Finish for Aluminum luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
    2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
    3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
    4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
  - O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
    1. Label shall include the following lamp and ballast characteristics:
      - a. "USES ONLY" and include specific lamp type.

- b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.
- c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- d. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

## 2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
  1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
  2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
  1. Materials: Shall not cause galvanic action at contact points.
  2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
  3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.
- E. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

## 2.4 ALUMINUM POLES

- A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.
- B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.
  1. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

- C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- E. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
  - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
  - 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
  - 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

## 2.5 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

## PART 3 - EXECUTION

### 3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
  - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

### 3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
  - 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
  - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
  - 3. Trees: 15 feet from tree trunk.
- C. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- D. Raise and set poles using web fabric slings (not chain or cable).

### 3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

### 3.4 GROUNDING

- A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole.
  - 2. Install grounding conductor and conductor protector.
  - 3. Ground metallic components of pole accessories and foundations.

END OF SECTION 265600

## SECTION 31 11 00- CLEARING AND GRUBBING

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. Section Includes: Requirements for clearing and grubbing.
- B. Related Requirements:
  - 1. Section 003100 – Available Project Information; Attachment 1, Geotechnical Report.
  - 2. Section 015713 – Temporary Erosion and Sediment Control: Temporary erosion and sediment control features and requirements.
  - 3. Section 312200 – Finish Grading.

PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.

## 1.02 DEFINITIONS

- A. Clearing: Cutting, removal, and proper disposal of trees, stumps, brush, shrubs, rubbish, and other material as required to construct improvements shown and specified.
- B. Grubbing: Removal and disposal of stumps larger than 1-1/2-inch in diameter and other similar items to a depth of not less than 12 inches below finish grade.

## 1.03 SYSTEM DESCRIPTION

- A. Clear and grub project site as shown on the Drawings and specified in this Section.
- B. Clear and grub project site as required to complete project.

## 1.04 SUBMITTALS

- A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

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

#### 1.05 PROJECT CONDITIONS

- A. Site Information: Data in the subsurface investigation report was used for the basis of the design. The report is available for review. Conditions are not intended as representations or warranties of accuracy or continuity between soil. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
- B. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner's Representative and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Owner's Representative's written permission.
  3. Contact utility-locator service for area where Project is located before excavating.
- D. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

#### PART 2 – PRODUCTS (not used)

#### PART 3 – EXECUTION

##### 3.01 CLEARING AND GRUBBING

- A. Clear and grub areas to be occupied by facilities to be constructed, including areas to be excavated, filled, paved, or planted as shown on the Drawings.
- B. Clear and grub as required to complete project. Clear and grub easements as required to complete project. Do not clear or grub more than required to complete project.
- C. Existing palm trees on project site shall be removed and relocated to a site within the Owner's property as designated by the Owner.

##### 3.02 PROTECTION OF ADJACENT AREA

- A. Protect areas shown on the Drawings or designated by the Engineer to remain protected from damage by construction operations by erecting suitable barriers or other acceptable means.

- B. Areas outside limits of construction as shown on the Drawings shall be protected and no equipment or materials shall be stored on these areas or allowed to damage these areas.

### 3.03 DISPOSAL

- A. Remove roots, vegetation, and other debris from the site daily. Dispose of roots, vegetation, and other debris removed from the site at no cost to the owner.
- B. Do not burn any material on the site or other areas where burning is not permitted.

### 3.04 SOIL MATERIALS

- B. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, SW, and SP, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, GM, SC, SM, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- E. Backfill and Fill: Satisfactory soil materials.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 97 percent passing a 3-inch sieve and not more than 5 percent passing a No. 200 sieve.
- G. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- H. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- I. Clear and strip all surface vegetation, topsoil, roots, grass, organics, structures, appurtenances, pavements, and other deleterious material. Depth of removal is anticipated to be on the order of 6 inches or less.
- J. Proof-roll soils at the stripped surface areas with a minimum of 10 passes (30% overlap with preceding pass) of a heavyweight vibratory drum roller (minimum impact force of 20,000 pounds per drum to the soil). Any areas that yield during the proof-rolling operation or areas of deleterious material that are exposed during proof-rolling operation shall be over excavated, compacted, and replaced with compacted satisfactory material. Satisfactory material shall be placed in lifts not exceeding 12 inches in loose thickness. Thoroughly compact each lift with the vibratory roller. Prior to compaction, document condition of adjacent structures.

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Compaction shall cease if deemed harmful to adjacent structures. Compaction with a non-vibratory drum roller may be required to protect adjacent structures.

END OF SECTION 311100

## SECTION 312000 - EARTH MOVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Excavating and filling for rough grading the Site.
  - 2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
  - 3. Excavating and backfilling for buildings and structures.
  - 4. Drainage course for concrete slabs-on-grade.
  - 5. Subbase course for concrete walks and pavements.
- B. Related Requirements:
  - 1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping[ and stockpiling] topsoil, and removal of above- and below-grade improvements and utilities.
  - 2. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.
  - 3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
  - 4. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

## 1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work; only with advanced written authorization by Owner.
  - 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
  - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
  - 1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom.
  - 2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

- K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
  - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
    - a. Personnel and equipment needed to make progress and avoid delays.
    - b. Coordination of Work with utility locator service.
    - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
    - d. Extent of trenching by hand or with air spade.
    - e. Field quality control.
    - f. Compliance with the Groundwater and Soil Management Plan.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
  - 1. Geotextiles.
  - 2. Controlled low-strength material, including design mixture.
  - 3. Geof foam.
  - 4. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
  - 1. Geotextile: 12 by 12 inches (300 by 300 mm).
  - 2. Warning Tape: 12 inches (300 mm) long; of each color.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
  - 1. Classification according to ASTM D 2487.
  - 2. Laboratory compaction curve according to ASTM D 698.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

## 1.7 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

## 1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify 811 Sunshine One-Call for area where Project is located before beginning earth-moving operations.
- C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Cleaning and Grubbing" are in place.
- D. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- E. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- F. Do not direct vehicle or equipment exhaust towards protection zones.
- G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## PART 2 - PRODUCTS

## 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 1/2 inches (12.7 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

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

D. Sand: ASTM C 33/C 33M; fine aggregate.

## 2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:
  - 1. Portland Cement: ASTM C 150/C 150M, Type I.
  - 2. Fly Ash: ASTM C 618, Class C or F.
  - 3. Normal-Weight Aggregate: ASTM C 33/C 33M, 1/2-inch (12.7-mm) nominal maximum aggregate size.
  - 4. Foaming Agent: ASTM C 869/C 869M.
  - 5. Water: ASTM C 94/C 94M.
  - 6. Air-Entraining Admixture: ASTM C 260/C 260M.
- B. Produce conventional-weight, controlled low-strength material with 80-psi (550-kPa) compressive strength when tested according to ASTM C 495/C 495M.

## 2.3 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.
  - 4. Blue: Water systems.
  - 5. Green: Sewer systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

- A. Comply with Groundwater and Soil Management Plan.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### 3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches (600 mm) outside of concrete forms other than at footings.
    - b. 12 inches (300 mm) outside of concrete forms at footings.
    - c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
    - f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm).

### 3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."
3. Per LT-07

### 3.5 EXCAVATION FOR WALKS AND PAVEMENTS

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

### 3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
  3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
  4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
  1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
  3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

### 3.7 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
  - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- B. Store or stock pile Contaminated Soil per the Groundwater and Soil Management Plan.

### 3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring, bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

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

### 3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course.
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
  - 1. Soil Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1/2 inch (12.7 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
    - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
  - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

### 3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material per LL-06.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.

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

### 3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12 inches (304.8 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

### 3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
  - 2. Walks: Plus or minus 1 inch (25 mm).
  - 3. Pavements: Plus or minus 1/2 inch (13 mm).

- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

### 3.16 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

### 3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
  - 1. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
  - 3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
  - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.19 FIELD QUALITY CONTROL

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

- B. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length but no fewer than two tests.
  - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

## SECTION 312300 - TRENCH EXCAVATION AND FILL

## PART 1 – GENERAL

## 1.01 SUMMARY

A. Section Includes: Requirements for excavation, and backfilling of trenches.

1. Trenching and Backfilling

- a. Trenching and backfilling for Work included in this project is included in the lump sum cost for work installed, unless otherwise stated herein, and the lump sum price for work includes trenching and backfilling in whatever nature of material may be encountered. No additional allowance to the lump sum price proposal by the Contractor for the project or any part thereof will be allowed on any claim for extra compensation because of trenching, backfilling, or trenching and backfilling being of a nature different from that contemplated by Contractor.
- b. The Contractor is charged with the responsibility of actually investigating and examining the site of the project before preparing his proposal and satisfying himself in this respect.

**PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## 1.02 REFERENCES

A. General: References to standards, specifications, manuals, or codes of any technical society, organization or association, or to the Laws or Regulations of any government authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of proposals (or, on the Effective Date of the Agreement if there were no proposals), except as may be otherwise specifically stated in the Contract Documents.

B. ANSI/ASTM Standards

1. ANSI/ASTM C33 Concrete Aggregates
2. ANSI/ASTM D1557 Test Method for Laboratory Compaction Characteristics of Soil (AASHTO T-180) Using Modified Effort (56,000 ft.-lbf/ft<sup>3</sup>)(2,700 kN-m/m<sup>3</sup>)

C. ASTM Standards

1. ASTM D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
  2. ASTM D2487 Classification of Soils for Engineering Purposes
  3. ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Method (Shallow Depth)
  4. ASTM D2937 Test Method for Density of Soil in Place by the Drive-Cylinder Method
- F. Florida Department of Transportation (FDOT) Standards
1. Standard Specifications for Road and Bridge Construction
- G. State of Florida
1. Florida Trench Safety Act (90-96, Laws of Florida)
- H. Occupational Safety and Health Administration
1. Excavation Safety Standards, 29 C.F.R.s.1926.650 Subpart P.
- 1.03 DEFINITIONS
- A. General: Soil classifications presented in this Article are applicable to natural soils and processed materials.
- B. ASTM D2487 Unified Soil Classification System (USCS)
1. Class I: Angular, one-quarter inch (1/4") to one and one-half inch (1-1/2") graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed shells and crushed stone.
  2. Class II: Coarse sands and gravels with maximum particle size of one and one-half inches (1-1/2"), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. The following soil types are included in this class:
    - a. GW (well-graded gravel)
    - b. GP (pea gravel or crushed stone mixed with sand)
    - c. SW (well-graded sand)
    - d. SP (poorly graded sands and gravelly sands with little or no fines)
  3. Class III: Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixture and gravel-clay mixtures. The following soil types are included in this class:
    - a. GM (silty gravels)
    - b. GC (clayey gravels)
    - c. SM (silty sands)
    - d. SC (clayey sands)

4. Class IV: Silt, silty clays and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. The following soil types are included in this class:
    - a. CH (Inorganic clays of high plasticity)
    - b. CL (Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays)
    - c. MH (inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts)
    - d. ML (Inorganic silts, very fine sands, rock flour, silty or clayey fine sands)
  5. Class V: This class includes the following organic soils as well as soils containing frozen earth, debris, rocks larger than one and one-half inches (1-1/2") in diameter and other foreign materials:
    - a. OL (Organic silts and organic silty clays of low plasticity)
    - b. OH (Organic clays of medium to high plasticity)
    - c. PT (Peat, muck, and other highly organic soils)
- C. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
- D. Optimum Moisture: Percentage of water in a specific material at maximum density.
- E. Rock: A natural aggregate of mineral particles connected by strong and permanent cohesive forces. Rock includes:
1. Limestone, lime rock, sandstone, dolomite, granite marble, lava, and coral.
  2. Boulders 1/3 cubic yard or more in volume.
  3. Material which by actual demonstration cannot, in the Engineer's opinion, be reasonably excavated with a backhoe or 3/4 cubic yard capacity power shovel equipped with two rippers, or similarly approved equipment and which is, in fact, systematically drilled and blasted or broken by power operated hand tools. Engineer may waive demonstration requirement if material encountered is well-defined rock.
- F. Deleterious Materials: Household and construction debris, organic debris, peat and organic soils,
- 1.04 SYSTEM DESCRIPTION
- A. Perform excavation required to construct underground piping systems to lines and grades shown on the Drawings.
  - B. Provide, place, and compact pipe bedding and haunching as shown on the Drawings and specified in this Section.
  - C. Provide, place, and compact initial fill as shown on the Drawings and specified in this Section.
  - D. Provide, place, and compact final fill as shown on the Drawings and specified in this Section.
  - E. Place, compact, and test fill as specified in this Section.
  - F. Dispose of unsuitable and excess excavated material as specified in this Section.

- G. Grade final fill to elevations, lines, slopes, depths and cross-sections shown on the Drawings. Where no change in finish grade is indicated, grade final fill to elevations, lines, slopes, depths and cross-sections that existed prior to start of construction.

#### 1.05 QUALITY ASSURANCE

- A. General: Trenching and backfilling shall be performed by company with not less than five years of documented experience in underground utility construction.
- B. Soils Testing
  - 1. Contractor will employ and pay for services of an independent testing agency to perform specified testing and inspection.
  - 2. Schedule trenching and backfilling to permit a reasonable time for testing before placing succeeding lifts of installing pipe.
  - 3. Keep testing laboratory informed of structural earthwork progress.
- C. General Monitoring: Trenching and backfilling shall be monitored on a periodic basis by the independent testing laboratory for general compliance with the intent of these specifications.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall be responsible for delivery, storage, and handling of fill material from off-site sources.
- B. Comply with requirements of Federal, State, and County authorities regulating shipment of products.
- C. Contractor shall be responsible for storage and handling of on-site excavated suitable fill material.
- D. Do not allow fill material from off-site sources or on-site excavated suitable fill material to be mixed with unsuitable material.
- E. Do not allow stored fill material from off-site sources to be mixed with stored on-site excavated suitable fill material.
- F. Protect stored fill materials so that the composition of materials is not altered and materials are not otherwise degraded or contaminated.
- G. Prevent erosion of soil and fill materials and sedimentation of waterways, open drainage ways and storm and sanitary sewers due to construction activities, by complying with Section 015713 Temporary Erosion and Sedimentation Control.

#### 1.07 PROJECT/SITE CONDITIONS

- A. Regulatory Requirements

1. Conform to Federal and State regulatory requirements for excavations.
  2. Obtain excavation permit prior to starting trenching and backfilling. Conform to requirements of excavation permit.
  3. Provide barricades, warning signs, and lights as required by law, regulation, or law and regulation.
- B. Excavation Protection
1. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
  2. Grade top perimeter of trench to prevent surface water run off into trench.
- C. Protection of Adjacent Improvements
1. Underpin adjacent structures and utilities, including utility services, which may be damaged by excavation work.
  2. Repair damaged structures, utilities, or structures and utilities at no additional cost to the Owner.
- D. Protection of Benchmarks, Monuments, and Other Reference Points
1. Maintain benchmarks, monuments, and other reference points.
  2. Retain a Registered Land Surveyor who shall establish, for any benchmarks, monuments, and other reference points that might be disturbed by structural earthwork, references that will not be disturbed.
  3. Registered Land Surveyor shall replace benchmarks, monuments, and other reference points removed or otherwise disturbed.
- E. Geotechnical Data
1. Geotechnical data prepared for this project are available for review by the Contractor. Refer to Appendix A.
  2. Date and recommendations in the subsurface investigation report have been used by the Engineer in the preparation of the Drawings and Specifications.
  3. Geotechnical Data made available to the Contractor by the Owner, the Engineer, or the Geotechnical Consultant are not guaranteed as to accuracy or completeness. Geotechnical Data made available to the Contractor by the Owner, the Engineer, or the Geotechnical Consultant are not part of the Contract Documents. If Geotechnical Data made available to the Contractor by the Owner, the Engineer, or the Geotechnical Consultant are used by the Contractor, the Contractor shall assume all risks resulting from actual conditions differing from conditions set out in the Geotechnical Data.
- F. Unanticipated Conditions

1. Notify Engineer of unexpected subsurface conditions and discontinue work in affected area until notified by Engineer to resume work.
2. Take emergency measures as required to protect persons and improvements.

## PART 2 – PRODUCTS

### 2.01 SOURCE FOR BEDDING AND FILL MATERIALS

- A. Use excavated materials that meet the requirements specified in this Section.
- B. Furnish and install imported material if excavated material does meet the requirements of this Section.
- C. Excess excavated material that meets the requirements of this Section shall be stored at the project site until backfilling is completed. Do not remove excess excavated material that meets the requirements of this Section from the project site until backfilling is completed.

### 2.02 BEDDING

- A. Crushed Stone Bedding: Imported, graded stone meeting the requirements of Class I soil with maximum particle size equal to one-half inch (1/2").
  1. Size range and resulting high void ration of crushed stone bedding material makes it suitable for use to dewater trenches during pipe installation.
  2. The permeable characteristic of crushed stone dictates that use of crushed stone bedding material be limited to locations where pipe support will not be lost by migration of fine grained natural material from trench walls and bottom or migration of other embedment materials into crushed stone bedding material.
  3. When migration of fine grained natural material into crushed stone bedding is possible, minimum size range of crushed stone bedding shall be reduced to finer than one-quarter inch (1/4"), and gradation shall be selected to limit the size of the voids.
  4. An alternative to modifying the gradation is to use a geotextile fabric as a barrier to migration to fines.)
- B. Coarse Sand and Gravel Bedding: Coarse sands and gravels meeting the requirements of Class II soil with maximum particle size equal to three-quarter inch (3/4") and with less than five percent fines.
  1. Coarse-grained soils with less than 12 percent but more than five percent fines may be used for coarse sand and gravel bedding if approved by the Engineer.
  2. Gradation of coarse sand and gravel bedding material influences density and pipe support strength of coarse sand and gravel when bedding material is loosely placed. Gradation of coarse sand and gravel bedding material may be critical to the pipe support and stability of the foundation and embedment, if the material is imported and is not native to the trench excavation. Gradation other than well graded, such as uniformly graded or gap

graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and bottom.

3. When migration of fine grained natural material into coarse sand and gravel bedding is possible, adjust gradation of bedding material to limit size of voids so there is no migration of fines from trench walls or trench bottom into bedding material.
4. An alternative to modifying the gradation is to use a geotextile fabric as a barrier to migration of fines.

#### 2.03 HAUNCHING

- A. Haunching material shall be on-site or imported non-cohesive, non-plastic material free of debris and gravel larger than one-half inch in diameter.
- B. Haunching materials shall be Class I or Class II soils as defined in this Section.

#### 2.04 SELECT FILL

- A. Select fill shall be on-site or imported non-cohesive, non-plastic material free of debris and gravel larger than one-half inch in diameter.
- B. Select initial and final fill materials shall be Class I or Class II soils as defined in this Section.

#### 2.05 COMMON FILL

- A. Common fill shall be on-site or imported non-cohesive, non-plastic material, free of debris and rocks larger than six inches in diameter.
- B. Common initial fill materials shall be Class I, Class II, or Class III soils as defined in this Section.
- C. Common final fill materials shall be Class I, Class II, Class III or acceptable dry, native Class IV soils as defined in this Section.

### PART 3 – EXECUTION

#### 3.01 INSPECTION OF SOURCE FOR BEDDING AND FILL MATERIALS

- A. Verify approval of full or limited use of stockpiled fill.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Prior to trenching, cut or score pavement to straight edges, six inches outside each edge of the proposed trench. Do not damage pavement not removed.

#### 3.03 EXCAVATION

- A. Dewater trenches as specified in Section 02240 Dewatering.

- B. Excavate trench so that piping can be installed to alignment and depth shown on the Drawings and as specified.
- C. Trench width shall be ample to permit piping to be laid and jointed properly. Minimum trench width shall be at least three feet, six inches or eight inches greater than the largest outside diameter of the pipe or bell, whichever is greater.
- D. If sheeting is used, sheeting may be removed provided removal can be accomplished without disturbing bedding, pipe or alignment. Should Engineer determine that removal of sheeting will damage pipe, sheeting shall be left in place at no additional cost to the Owner. If left in place, cut sheeting off two feet above top of pipe and leave sheeting in place below cut. Any damage to pipe bedding, pipe, or alignment caused by removal of sheeting shall be cause for rejection of the affected portion of the Work.
- E. Open no more than 100 feet of trench ahead of pipe laying operations at one time unless a greater length of trench is approved by the Engineer.

### 3.04 TRENCH BOTTOM

- A. Excavate trench to elevation required for pipe material.
  - 1. For piping that does not require bedding below bottom of pipe, excavate trench to bottom of pipe.
  - 2. For piping that requires bedding below bottom of pipe, excavate trench to bottom of bedding below pipe.
- B. Soil surface at trench bottom shall provide a firm, stable and uniform support for pipe. Soil surface at trench bottom shall be free of any protrusions which may cause point loading on any portion of pipe or bell.
- C. Do not over-excavate trench bottom if trench bottom material is stable undisturbed soil of the follow types:
  - 1. Class II soil including types GW, GP, SW and SP.
  - 2. Class III soil including types GM, GC, SM and SC.
  - 3. Class IV soil including types CL and ML.
- D. Do not bed pipe on solid rock, boulders, hardpan, unsuitable soils, organic material, or other materials that are not suitable for trench bottom. Remove soils and other materials that are not suitable materials for trench bottom. Remove soils and other materials that are not suitable materials for trench bottom to six inches under pipe, minimum.
  - 1. Remove wet, yielding, or mucky soils. Remove the following soils:
    - a. Type CH and Type MH Class IV soils.
    - b. All Class V soils.
  - 2. Remove organic material including roots, mulch, or other vegetable matter, which in the opinion of the Engineer, will result in unsatisfactory foundation conditions.

3. Remove soils containing cobbles, boulders or stones larger than one and one-half inches (1-1/2") in diameter.
  4. Remove ledge rock and hardpan. Remove rock and hardpan to provide bedding width 24 inches wider than pipe.
  5. Remove soils containing rubbish, trash, or other foreign materials.
- E. Replace ledge rock, hard pan, boulders, unsuitable soils, and soil containing material that is not suitable for trench bottom.
1. Over-excavation Replacement for Piping that Does Not Require Bedding below Bottom of Pipe
    - a. If trench is over-excavated more than six inches below the bottom of the pipe, but less than twelve inches below the bottom of the pipe, fill and compact over-excavation with acceptable Class I, II or III soil as defined in this Section.
    - b. If trench is over-excavated more than twelve inches below bottom of pipe, fill and compact over-excavation with crushed stone bedding.
  2. Over-excavation Replacement for Piping that Requires Bedding below Bottom of Pipe: Fill and compact over-excavation to bottom of bedding with Class I soil as defined in this Section.

### 3.05 BEDDING

- A. General: Properly bed pipelines, conduits and appurtenances as shown on Drawings and as specified in this Section.
- B. Bedding for PVC Pipe: Place and compact crushed stone bedding from a minimum of 1/4 diameter of pipe below invert of pipe to bottom of pipe.
- C. Bedding for Ductile Iron Pipe
  1. If trench bottom at bottom of pipe is Class I, Class II, Class III or acceptable dry, native Class IV soils as defined in this Section, bed pipe on trench bottom.
  2. If trench bottom is not acceptable for bedding, place crushed stone bedding or coarse sand and gravel bedding from a minimum of 1/4 diameter of pipe below invert of pipe up to bottom of pipe.
- D. Preparation of Trench Bottom for Piping and Conditions that Do Not Require Bedding below Bottom of Pipe
  1. Compact trench bottom as required to achieve density specified for bedding, haunching, and backfill. Minimum compaction for trench bottom shall be 90% of Modified Proctor Maximum Dry density (ASTM D1557).
  2. Bring trench bottom to grade prior to installation of pipe, fittings, and valves. Bring trench bottom to grade along entire length of pipe.

- E. Preparation of Trench Bottom for Piping or Conditions that Require Bedding below Bottom of Pipe
  - 1. Excavate trench bottom and place bedding material, so that bedding grade is correct following compaction of bedding.
  - 2. Uniformly compact bedding. Use hand or mechanical tamping to compact bedding material.
  - 3. Compact bedding material as required to achieve density specified for haunching and backfill. Minimum compaction of bedding material shall be 95% of Modified Proctor Maximum Dry density (ASTM D1557).
  - 4. Bring bedding material to grade prior to installation of pipe, fittings, and valves. Bring bedding material to grade along entire length of pipe.
  
- 3.06 HAUNCHING
  - A. Haunching for PVC Pipe: Place crushed stone bedding material from top of bedding to spring line (centerline) of pipe.
  - B. Haunching for Ductile Iron Pipe
    - 1. If trench bottom at bottom of pipe is Class I, Class II, Class III or acceptable dry, native Class IV soils as defined in this Section, place haunching material from trench bottom to spring line (centerline) of pipe.
    - 2. If trench bottom is not acceptable for bedding, place crushed stone bedding or coarse sand and gravel bedding material from top of bedding up to 1/8 diameter of pipe. Place haunching material from top of crushed stone bedding or coarse sand bedding material to spring line (centerline) of pipe.
  - C. Piping Support: Support piping during placement and compaction of haunching.
  - D. Placing Haunching Material
    - 1. Do not place haunching over porous, wet, or spongy trench bottom or bedding material.
    - 2. Hand place haunching material.
    - 3. Place haunching evenly along both sides of pipe, fittings, and valves so that equal load is maintained along both sides of pipe, fittings, and valves.
    - 4. Work haunching under pipe, fittings, and valves so that there are no voids in fill and so that pipe, fittings, and valves are properly supported.
    - 5. Place haunching so that piping materials, coatings, and encasement are not damaged.
  - E. Haunching Material Compaction
    - 1. Compact haunching material

2. Compact haunching so that pipe, fittings, and valves are properly supported.
3. Compact haunching as required to achieve density specified for backfill material.
4. Minimum compaction of haunching shall be 95% of Modified Proctor Maximum Dry density (ASTM D1557).

### 3.07 INITIAL BACKFILL

- A. Initial backfill shall extend from the top of haunching to one foot above top of pipe. Placement of initial backfill may be either by hand or mechanical means.
- B. Initial fill in trenches wholly or partially beneath paved areas as follows shall be select initial fill:
  1. Public streets, roads, and parking areas.
  2. Institutional roads, drives, and parking areas.
  3. Commercial roads, drives, and parking areas.
- C. Initial fill in trenches beneath unimproved areas, lawns, landscaping, private drives, and private parking areas shall be common initial fill unless otherwise shown on the Drawings.
- D. Keep initial backfill free from debris, rocks, clods, and other items larger than one-half inch (1/2").
- E. Do not compact initial fill directly over pipe, fittings, or valves until adequate cover has been provided to prevent damage to pipe, fitting, or valve. Adequate cover will depend on piping materials and type of compaction equipment used. Adequate cover shall be as accepted by the Engineer.
- F. Minimum compaction of initial fill shall be 95% of Modified Proctor Maximum Dry density (ASTM D1557).

### 3.08 FINAL BACKFILL

- A. Backfill trenches to contours and elevations shown on drawings, or to match existing grade if finish grade is not changed.
- B. Final backfill in trenches wholly or partially beneath paved areas as follows shall be select initial fill:
  1. Public streets, roads, and parking areas.
  2. Institutional roads, drives, and parking areas.
  3. Commercial roads, drives, and parking areas.
- C. Final backfill in trenches beneath unimproved areas, lawns, landscaping, private drives, and private parking areas shall be common initial fill unless otherwise shown on the Drawings.
- D. Backfill trench systematically, as early as possible, to allow maximum time for natural settlement.

- E. Place and compact select fill material in continuous layers not exceeding 6 inches in depth. Minimum compaction of select fill shall be 98% of Modified Proctor Maximum Dry density (ASTM D1557). Compaction of select fill shall be by small portable plate compactor or other approved method.
- F. Place and compact common fill material in continuous layers not exceeding 12 inches in depth. Minimum compaction of common fill shall be 95% of Modified Proctor Maximum Dry density (ASTM D1557). Compaction of common fill shall be by mechanical means or other approved methods.

### 3.09 COMPACTION

#### A. Compaction Equipment

1. Compaction shall be accomplished by use of appropriate compaction equipment.
2. Compact each lift by repeated passes of appropriate compaction equipment.
3. Select and operate compaction equipment so that pipe and structures are not damaged by compaction operation.

#### B. Moisture Control

1. Control moisture content of soil during compaction as required to achieve specified compaction.
2. Moisture content of fill and backfill material shall be within plus or minus 2% of optimum moisture content during compaction of fill and backfill material.
3. If necessary, add water or allow material to dry until the proper moisture content for the specified compaction is obtained.

#### C. Compaction Testing

1. Test compaction of bedding, haunching, initial backfill, and final backfill as specified in this Section.
2. Test each compacted soil layer, in place, prior to placement of succeeding layers.

### 3.10 TESTING

- A. Retain a laboratory approved by Engineer to make field density tests and Proctor Tests as specified below.
  1. Contractor shall pay the cost of initial density test(s).
  2. Contractor shall pay cost for any additional testing required as a result of failure of any initial test.
- B. Perform one Proctor Test, according to ASTM D1557, for each source of fill used on the Project. If material from excavation is used as backfill material, take a test proctor from the best available location as determined by the testing lab.

- C. Determine Optimum moisture content of fill, subgrade, and backfill material by Modified Proctor Method (ASTM D1557).
- D. Test the density of compacted bedding, haunching, and initial fill. Test the density of each compacted final fill layer in place. Field density tests shall meet the requirements of ASTM D1556, ASTM D2922, or ASTM D2937.
- E. Perform density tests for initial backfill and final backfill as follows:
  - 1. Initial Backfill                      1 test per layer for each 300 foot length of trench (minimum 1 test per day)
  - 2. Select Final Backfill              1 test per layer for each 300 foot length of trench (minimum 1 test per day)
  - 3. Common Final Backfill:        1 test for each 300 feet of trench.
- F. Perform additional field density tests as follows:
  - 1. If test density of compacted backfill or fill is less than specified density, make additional tests at locations directed by Engineer.
  - 2. Make additional field density tests at no additional cost to the Owner.
- G. Allow for inspection of import fill by Engineer at the source before delivery to site.

3.11 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

- A. Remove unsuitable material and excess excavated suitable material from the Project.
- B. Remove, temporarily stockpile, and dispose petroleum impacted soil off site.

END OF SECTION 312300

## SECTION 312319 - DEWATERING

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. Section Includes: Requirements for dewatering excavations and trenches.

Unless specifically authorized by the Owner, all pipe, and structures shall be installed "in the dry". The contractor shall dewater trench excavation as required for the proper execution of the work, using one or more of the following approved methods: well point system, and or pumps with silt box and filtering system.

Contractor shall design and provide a ground water treatment system plan comprised of the following:

- A large settling tank (silt box) with baffles for the removal of large solids and free product
- Sock Bag filters shall be attached to the discharge hose into the settling tank and sewer manholes for the removal of suspended solids. Contractor responsible for determining number of discharge hose's required from the settling tank to the manhole to maintain adequate flow.

Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining a high vacuum, and at the same time, of handling large volumes of air as well as of water.

Pumps shall be capable of handling the water the contractor need removed to perform the work. Sock filters shall be provided on the pump discharge at the silt box and manhole discharge. Filter cloth draped in manhole shall not be used except for temporary basis of less than 4 hours. Silt boxes shall be capable of handling the water the contractor needs removed to perform the work. Silt box discharged into the sewer systems shall have filter socks on the discharge hose. The contractor shall provide multiple discharge hose with filtering sock if required to remove the water from the silt box. Silt boxes shall be cleaned daily. Socks shall be replaced as needed. Sock(s) with holes or cuts shall be replaced immediately.

The Contractor shall be responsible for disposing into the city sewer system of all water resulting from trench dewatering operations, and shall dispose of the water without damage or undue inconvenience to the work, the surrounding area, or the general public. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements or other structures: and to do this he may be required to conduct the water to a suitable place of discharge may be determined by the Owner.

The contractor shall not dewater into the permitted stormwater gravity injection well at the project site.

The contractor shall be responsible for payment to the city for the cleanup of the sewers system and any repairs that are determined to have been caused by the project dewatering.

- B. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES**

**ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

### 1.03 SUBMITTALS

- A. General: As specified in:
  - 1. General Conditions;
  - 2. Division 1;
- B. Submit copy of dewatering permit prior to installing dewatering system, or systems.
- C. Submit dewatering plan, or plans, prior to installing dewatering system, or systems.
  - 1. Contractor is responsible for the de-watering plan; should the contractor require additional de-watering requirement this shall be done at no additional cost to the owner.
  - 2. Dewatering shall be done to the City’s sewer system.

### 1.04 QUALITY ASSURANCE

- A. Regulatory Requirements
  - 1. Obtain Dewatering Permit from South Florida Water Management District prior to dewatering of any areas. Make application and arrangements and pay fees and charges for dewatering and disposal of discharge from dewatering
  - 2. Submit copy of dewatering permit.
  - 3. Comply with requirements of dewatering permit. Meet regulatory requirements relative to dewatering and disposal of discharge water from dewatering.

### 1.05 PROJECT/SITE CONDITIONS

- A. Noise Limitations.
  - 1. Dewatering systems and equipment shall comply with ordinances regulating noise.
  - 2. Provide “residential” mufflers on engines.
  - 3. Provide sound attenuating enclosures over dewatering system equipment if necessary to meet noise limit requirements of ordinances and regulations.
  - 4. Do not shut off dewatering systems to meet noise limitations during non-work hours. Provide sound attenuating measures to meet noise limit requirements.

5. Provide sound attenuating equipment, devices, and measures at no additional cost to the Owner.
6. Modify dewatering system, or systems, as required to comply with ordinances regulating noise.

B. Damage Prevention

1. Dewatering shall not cause settlement of existing or new structures. Repair or replace structures damaged by settlement caused by dewatering. Repair or replace structures at no additional cost to the Owner.
2. Discharge from dewatering systems shall not cause erosion of turf or soil. Replace turf damaged by dewatering discharge. Replace soil displaced by dewatering discharge. Replace turf and soil at no additional cost to the Owner.
3. Discharge from dewatering systems shall not damage landscaping. Replace landscaping damaged by dewatering discharge. Replace landscaping at no additional cost the Owner.
4. Modify dewatering system, or systems, as required to eliminate conditions that cause damage.

C. Access

1. Dewatering systems and dewatering system operations shall not prevent emergency access or prevent persons living in the vicinity of construction from completing their normal daily pursuits.
2. Provide temporary access over dewatering system piping for vehicular and pedestrian traffic.

PART 2 – PRODUCTS

2.01 DEWATERING SYSTEMS

- A. Contractor shall be responsible for the sizing and selection of dewatering systems, dewatering equipment, dewatering system piping, and appurtenances.

PART 3 – EXECUTION

3.01 GROUNDWATER

- A. Contractor shall be responsible for evaluating and determining groundwater conditions.

3.02 DEWATERING PLAN

- A. Contractor shall prepare and submit dewatering plan for each dewatering system
- B. Ground water plan shall include the following:
  1. Groundwater data and assumptions relating to groundwater conditions.

2. Description of proposed dewatering system with drawings, diagrams, and system component data as applicable.
3. Proposed measures to insure dewatering system reliability.
4. Description of discharge water disposal methods.
5. Identification and location of private water supply wells, public water supply wells, lakes, and ponds that may be affected by dewatering.
6. Anticipated affect upon private water supply wells, public water supply wells, lakes, and ponds that may be impacted by dewatering. Proposed measures to ameliorate effects of dewatering upon private water supply wells, public water supply wells, lakes, and ponds.
7. Other data pertinent to the dewatering system.

### 3.03 DEWATERING SYSTEMS

- A. Provide, operate, and maintain dewatering systems including well points, wells, chemical grouting, water tight sheeting, ground freezing, tremie wall, or any other technology as may be necessary to accomplish dewatering in a safe and proper manner.
- B. Provide dewatering systems that control groundwater level in conformance with the requirements of this Section. Provide dewatering systems that lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide dewatering systems that continuously maintain groundwater level at, or below, level shown, specified, or shown and specified until backfilling and compaction have been completed to level shown, specified, or shown and specified.
- C. Provide automatic starting devices, standby pumps, and other equipment and controls required to provide continuous dewatering in the event of an outage of dewatering pump or other dewatering system component.
- D. Provide headers, suction piping, and discharge piping as required to convey water from well points, dewatering wells, and caissons to dewatering system discharge point designated in permit and accepted dewatering plan.
- E. Modify dewatering system during the course of construction as conditions that affect dewatering change.

### 3.04 DEWATERING OPEN EXCAVATIONS

- A. Lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide monitoring wells or other means to measure groundwater level prior to starting excavation.
- B. Dewater excavation from outside the limits of excavation. Dewater excavation from below the bottom of excavation. Do not dewater excavation from sumps within excavation.
- C. Dewatering measures shall provide the following:
  1. Prevent instability of excavation due to groundwater.

2. Prevent the disturbance of subgrade bearing materials due to groundwater.
  3. Keep excavation free from standing water and running water.
  4. Prevent tanks, pipes, and other structures from being displaced by hydrostatic pressures.
- D. Do not install or operate dewatering systems that allow movement of soil through excavation or excavation subgrade.
- E. Do not install or operate dewatering systems that allow movement of soil from beneath existing or previously installed structures or pipes.

### 3.05 DEWATERING TRENCHES

- A. Lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide monitoring wells or other means to measure groundwater level prior to starting excavation.
- B. Dewater trench from outside the limits of trench. Dewater trench from below the excavated trench bottom. Do not dewater trench from sumps within trench.
- C. Dewater trench to a minimum level of 24 inches below excavated trench bottom. Maintain water level a minimum of 24 inches below excavated trench bottom until backfill meets the following requirements:
1. Backfilling and compaction have progressed as to a depth that installed piping will not be displaced by hydrostatic pressure.
  2. Backfilling and compaction have been completed above natural water table to a level that remaining backfill can be placed and compacted as specified in Section 31 23 00 Excavation and Fill.
- D. Dewatering measures shall provide the following:
1. Prevent instability of trench due to groundwater.
  2. Prevent the disturbance of subgrade bearing materials due to groundwater.
  3. Keep trench free from standing water and running water.
  4. Prevent tanks, pipes, and other structures from being displaced by hydrostatic pressures.
- E. Do not install or operate dewatering systems that allow movement of soil through trench or trench subgrade.
- F. Do not install or operate dewatering systems that allow movement of soil from beneath existing or previously installed structures or pipes.

### 3.06 SURFACE WATER CONTROL

- A. Do not allow surface runoff to flow into excavations and trenches.

1. Grade top perimeter of excavation to prevent surface water run-off to flow into excavation.
  2. Grade sides and ends of trench to prevent surface water run-off to flow into trench.
- B. Do not allow storm water to puddle or pond on construction site except in designated storm water retention areas. Grade construction areas so that storm water drains to storm water system.
- C. Do not allow storm water to flow off construction site except through permitted discharge structures and through permitted storm water pipes, conduits, and channels.
- D. Do not allow storm water to flow into or through stored fill and backfill materials.

### 3.07 DEWATERING DISCHARGE CONTROL

- A. Discharge water from dewatering system to storm drain systems in accordance with dewatering permit and as specified in this Section. Provide silting basins and other discharge treatment systems in accordance with dewatering permit and to meet discharge permit requirements.
- B. Do not allow discharge from dewatering system to puddle or pond on construction site except in areas designated and approved to receive discharge from dewatering system.
- C. Do not allow to discharge from dewatering system to flow off construction site except through permitted discharge structures and through pipes, conduits, and channels that have been designated and approved for discharge flow from dewatering systems.
- E. Do not use sanitary sewers for disposal of water from water control systems. Do not use sanitary sewer system under construction as conduit to remove ground water from trench.
- F. Do not use storm sewer under construction as conduit to remove ground water from trench. Do not use new storm water system for dewatering system discharge unless new storm water system has been approved for dewatering system discharge.
- G. Do not discharge water containing settleable solids into storm sewers.
- H. Do not contaminate or disturb the environment of properties adjacent to the Work.
- I. Do not contaminate streams or other surface waters.
- J. Provide temporary facilities and controls for dewatering system discharge. Temporary facilities and controls shall be appropriate to the project, including, but not limited to:
1. Silting basin, or basins, of adequate size.
  2. Filters.
  3. Coagulants.
  4. Screens.
- H. Discharge onto pavement shall not damage pavement.

### 3.08 DEWATERING SYSTEM REMOVAL AND CLEANUP

- A. Completely remove dewatering systems installed for construction.
- B. Plug and seal dewatering wells after dewatering operations are concluded. Plug and seal dewatering wells in accordance with permit requirements.
- C. Remove and dispose of solids, including sand, mud, and other material, discharged from dewatering systems.

### 3.09 GENERAL ADDITIONAL REQUIREMENTS

- A. Contractor shall design and provide a ground water treatment system plan comprised of the following:
  - A large settling tank (silt box) with baffles for the removal of large solids and free product
  - Sock Bag filters shall be attached to the discharge hose into the sewer manholes for the removal of suspended solids. Contractor responsible for determining number of discharge hose's required from the settling tank to the manhole to maintain adequate flow.
- B. Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining a high vacuum, and at the same time, of handling large volumes of air as well as of water. Pumps shall be capable of handling the water the contractor need removed to perform the work. Sock filters shall be provided on the pump discharge at the silt box and manhole discharge. Filter cloth draped in manhole shall not be used except for temporary basis of less than 4 hours.
- C. Silt boxes shall be capable of handling the water the contractor needs removed to perform the work. Silt box discharged into the sewer systems shall have filter socks on the discharge hose. The contractor shall provide multiple discharge hose with filtering sock if required to remove the water from the silt box. Silt boxes shall be cleaned daily. Socks shall be replaced as needed. Sock(s) with holes or cuts shall be replaced immediately. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements or other structures: and to do this he may be required to conduct the water to a suitable place of discharge may be determined by the Owner.
- D. The contractor shall not dewater into the permitted stormwater gravity injection well at the project site.

END OF SECTION 312319

## SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. Section Includes: Requirements for erosion and sedimentation control.

## 1.02 DEFINITIONS

- A. The phrase "DOT Specifications" shall refer to the most current Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

## 1.03 SYSTEM DESCRIPTION

- A. Obtain permits required by regulatory authorities having jurisdiction and required by the Owner for installation, maintenance, and removal of erosion and sedimentation control measures.
- B. Furnish and install erosion and sedimentation control measures.
- C. Provide labor, equipment, and services required to maintain erosion and sedimentation control measures.
- D. Remove erosion and sedimentation control measures that are not a permanent part of Work.

## 1.04 SUBMITTALS

- A. General: As specified in:
  - 1. Division 1;
  - 2. This Section
- B. Submit copy of Erosion Control Plan prior to installing erosion and sedimentation control measures.
- C. Submit erosion and sedimentation control plan approved by State, local, or State and local authorities.

## 1.05 PROJECT/SITE CONDITIONS

- A. Regulatory Requirements
  - 1. Dewatering
    - a. Comply with requirements of permits for erosion and sedimentation control.
  - 2. Stormwater Pollution Prevention Plan

- a. Prepare "Notice of Intent to Use Generic Permit for Stormwater Discharge from Construction Activities that Disturb Five or More Acres of Land". Submit application and pay fee for review and approval of Notice.
- b. Obtain response to Notice prior to starting construction.
- c. Comply with requirements of Stormwater Pollution Prevention Plan and Generic Permit for Stormwater Discharge from Construction Activities that Disturb Five or More Acres, including modifications, addenda, and additions by Federal, State, and County regulatory authorities having jurisdiction.

## PART 2 – PRODUCTS

### 2.01 MATERIALS FOR EROSION AND SEDIMENT CONTROL

#### A. Filter Fabric

1. Filter Fabric Material: Nylon, polyester, propylene or ethylene yarn with ultraviolet ray inhibitors and stabilizers conforming to Section 985 of the DOT Specifications.
2. Filter Fabric Flow: 0.3 gallons per foot per minute, minimum.

#### B. Sediment Fence Posts

1. Post Material: Pine
2. Post Diameter: four inches
3. Post Length: Four feet, minimum.

## PART 3 – EXECUTION

### 3.01 EROSION CONTROL PLAN

- A. Excavation method shall be selected by the Contractor, unless otherwise shown on the Drawings or required by local regulations
- B. Contractor shall be responsible for erosion and sedimentation control.
- C. Prepare and submit an Erosion Control Plan based upon the proposed excavation method.
- D. Erosion Control Plan shall be reviewed and accepted by the Engineer prior to commencement of any land disrupting activities. Erosion Control Plan shall be reviewed and accepted by State, local, or State and local authorities having jurisdiction over erosion and sedimentation control prior commencement of any land disrupting activities.
- E. Submit erosion and sedimentation control plan approved by State, local, or State and local authorities.

### 3.02 LOCATION

- A. The type of sedimentation and erosion control (SEC) devices to be employed on the project will depend on location and adjoining features of the land at that location.
- B. Construct SEC devices in accordance with approved Erosion Control Plan.

3.03 SEDIMENT FENCE CONSTRUCTION

- A. Locate sediment fence down-slope from source of sediment. Extend sediment fence around source of sediment so that all run-off from source of sediment flows through sediment fence.
- B. Set posts down-slope of fabric.
- C. Bury toe of fence approximately eight inches deep.
- D. When joints are necessary, securely fasten fabric at support post with overlap to next post.

3.04 SILTATION AND BANK EROSION

- A. Take adequate precautions to minimize siltation and bank erosion in ditches, in discharging well point systems, or during other construction activities.

END OF SECTION 312500

SECTION 321216 - ASPHALT PAVING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: This section covers the work necessary for the construction of the Asphalt / Pavement.

- 1. Type SP- 9.5 ..... 9.5 mm
- 2. Type SP- 12.5 ..... 12.5 mm

1.02 REFERENCES; FDOT LOCAL AGENCY SPECIFICATIONS (LAP) AND STANDARD SPECIFICATIONS / LOCAL AGENCY SPECIFICATIONS

- A. The term "Standard Specifications" is used; such reference shall mean the most current edition of Florida Department of Transportation Standard Specification for Road and Bridge Construction and LAP Specifications. The Standard Specifications shall be considered as part of this section of the Specifications; below are Listed references for the contractor’s convenience; the contractor shall be responsible for obtaining and incorporation in the contract all of the Standard Specification’s and the most current revisions that apply to this contract scope of work. The contractor shall document in his daily reports the required Standard Specifications that are used.
- B. Reference(s):

- 1. SECTION 334 HOT MIX ASPHALT FOR LOCAL AGENCIES
- 2. SECTION 120 EARTHWORK AND RELATED OPERATIONS FOR LOCAL AGENCIES
- 3. SECTION 710 PAINTED PAVEMENT MARKINGS
- 4. SECTION 711 THERMOPLASTIC TRAFFIC STRIPES AND MARKINGS
- 5. 911 LIMEROCK MATERIAL FOR BASE AND STABILIZED BASE
- 6. SECTION 971 TRAFFIC MARKING MATERIALS

- C. Any reference of the “FDOT”, “Agency” “Engineer” “Local Agency” in the LAP SPECS, and "Standard Specifications" shall be considered to be the Owner (City of Key West) for this contract. LAP SPECS are available at:

<http://www.dot.state.fl.us/specificationsoffice/Implemented/LAP/LapSpecs/Default.shtm>

1.03 DEFINITIONS

- A. The phrase "FDOT Specifications" shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

1.04 SYSTEM DESCRIPTION

- A. Furnish and install asphaltic concrete pavement as shown on the Drawings and specified in this Section. Furnish and install asphaltic concrete pavement in accordance with the lines, grades and typical section as indicated on the Drawings.

- B. Furnish and install new asphaltic concrete pavement required to complete the paving work.
- C. Furnish and install asphaltic concrete topping as indicated on the Drawings.
- D. Repair asphaltic concrete pavement damaged as a result of completing Work and damaged by construction operations.

#### 1.05 SUBMITTALS

- A. General: As specified in:
  - 1. Division 1;
  - 2. This Section
- B. Submit proposed formula for asphaltic concrete paving prior to starting pavement work.

#### 1.06 QUALITY ASSURANCE

- A. FDOT Specifications referred to in this Section are made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as through reproduced herein in their entirety.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. General
  - 1. Product Delivery: As specified in Section 01650 Product Delivery Requirements.
  - 2. Product Storage and Handling: As specified in Section 01660 Product Storage and Handling.
- B. Asphaltic Concrete Pavement Materials: Delivery, storage, and handling of asphaltic concrete pavement materials shall meet the requirements of FDOT LAP / Specifications.

#### 1.08 PROJECT/SITE CONDITIONS

- A. Environmental Requirements
  - 1. Do not place base, prime coat, tack coat, or asphaltic concrete when rain is falling or when there is water on the surface to be covered.
  - 2. Monitor climatic conditions and anticipate conditions producing rainfall.
  - 3. Remove and replace materials damaged by rainfall or standing water.

#### 1.09 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL**

**BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. Lime Rock Base: Lime Rock base shall be in accordance with Section 911 of the FDOT Specifications.
- B. Soil-Cement Base: Soil Cement base shall be in accordance with Section 270 of the FDOT Specifications.
- C. Prime Coat: Material used for prime coat shall be cut-back Asphalt Grade RC-70 conforming to Sections 300 and 916 of the FDOT Specifications for prime to be used on Miami Oolite formation lime rock.
- D. Tack Coat: Material used for tack coat shall be Emulsified Asphalt Grade RS-2 conforming to Sections 300 and 916 of the FDOT Specifications. All areas to be paved shall receive a final tack coat that provides a uniform finish for new and existing paving.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Subgrade
  - 1. Stabilize roadway subgrades to the minimum depth shown on the Drawings to a Limerock Bearing Ratio of not less than 40. Stabilizing shall be Type B as defined in Section 160 of the FDOT Specifications. Stabilization may require addition and thorough mixing in of crushed limerock, course limerock screenings, or any other stabilizing material acceptable to the Engineer. Apply stabilizing material in such quantity that, after mixing and blending, the subgrade will have a LBR of not less than 40. Mix, blend, or mix and blend stabilizing material into subgrade material by plowing, scarifying, disking, harrowing, blading and mixing with rotary tillers until mixed materials are of uniform bearing value throughout width and depth of layer being processed.
  - 2. Make not less than three density determinations on each day's final compaction operations on each course. Make density determinations at more frequent intervals if deemed necessary by the Engineer.
- B. Base
  - 1. Construct Base in accordance with Section 230 of the FDOT Specifications, to the thickness and width indicated on the Drawings.

2. After spreading of the base material is completed, scarify entire surface and shape surface to produce the exact grade and cross section after compaction. For double course base, extend scarifying to a depth sufficient to penetrate slightly the surface of the first course. The maximum depth of each lift shall be 8 inches.
  3. When the material does not have the proper moisture content to insure the required density, wetting or drying shall be required.
    - a. If the material is deficient in moisture, add and uniformly mix in water by disking the base course to the full depth of the base course.
    - b. If the material contains an excess of moisture, allow the material to dry to proper moisture content before compacting material.
  4. As soon as proper conditions of moisture are attained, compact material to an average density not less than 98 percent maximum density as determined in more than one course, the density shall be obtained in each lift of the base.
  5. During final compacting operations, if blading of any areas is necessary to obtain true grade and cross section, complete compacting operations for such areas prior to making density determination on finished base.
  6. Unless otherwise directed by the Engineer, "hard-plane" the surface with a blade grader immediately prior to the application of the prime coat to remove the thin glaze or cemented surface and to allow free penetration of the prime material. Materials planed from the base shall be removed from base area.
  7. If cracks or checks appear in the base, either before or after priming, which in the opinion of the Engineer, would impair the structural efficiency of the base course, remove such cracks or checks by rescarifying, reshaping, adding base material where necessary and recompacting, at no additional cost to the Owner.
  8. If at any time the subgrade material shall become mixed with the base course material, dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean base material. Shape and compact clean base material as specified in this Article. Remove, replace, shape, and compact material at no additional cost to the Owner.
- C. Prime Coat: Apply prime coat at a rate of 0.15 gallons per square yard, and perform the Work in accordance with Section 300 of the FDOT Specifications.
- D. Tack Coat: Apply tack coat at a rate between 0.02 and 0.10 gallons per square yard, and perform the Work in accordance with Section 300 of the FDOT Specifications.
- E. Asphaltic Concrete: Spreading, compact, and joint the wearing surface in accordance with Sections 330, 332, 333 of the FDOT Specifications to the thickness indicated on the Drawings.

### 3.02 PAVEMENT REPAIR

- A. Repair damage to pavement as a result of Work under this Contract. Repair damage to pavement in a manner satisfactory to the Engineer and at no additional cost to the Owner.

Pavement repair shall include preparation of the subgrade, placing and compacting of the limerock base, priming of the base, and placing and maintaining of surface treatment, as specified in this Section.

- B. Width of repairs shall extend at least 12 inches beyond the limit of damage. Edge of pavement to be left in place shall be cut to a true edge with a saw or other acceptable method that provides a clean edge to abut repair. Line of the repair shall be reasonably uniform with no unnecessary irregularities.

END OF SECTION 321216

## SECTION 321313 - CONCRETE PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes Concrete Paving Including the Following:
  - 1. Ribbon curb.
  - 2. Concrete band.
  - 3. Landscape curb.
  - 4. Walks.
- B. Related Requirements:
  - 1. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
  - 2. Section 321723 "Pavement Markings."
  - 3. Section 321726 "Tactile Warning Surfacing" for detectable warning.

## 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

- C. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
  - 1. "Picture Frame" Finish: 60" x 60" square.
- D. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Fiber reinforcement.
  - 4. Admixtures.
  - 5. Curing compounds.
  - 6. Applied finish materials.
  - 7. Bonding agent or epoxy adhesive.
  - 8. Joint fillers.
- C. Material Test Reports: For each of the following:
  - 1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.

2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 60 inches (1524 mm) by 60 inches (1524 mm).
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

#### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

#### 1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:
  1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

#### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
  1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

#### 2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from galvanized-steel wire into flat sheets.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

- C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.
- H. Plain-Steel Wire: ASTM A 1064/A 1064M, galvanized.
- I. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated, plain.
- K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.
- L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.
- M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- Q. Zinc Repair Material: ASTM A 780/A 780M.

## 2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
1. Portland Cement: ASTM C 150/C 150M, gray portland cement Type I.
  2. Fly Ash: ASTM C 618, Class C.
  3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4M, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Euclid Chemical Company (The); an RPM company; PSI Fiberstrand Multi-Mix 80.
    - b. FORTA Corporation; FORTA ECONO-MONO.
    - c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace MicroFiber.
    - d. Metalcrete Industries; Polystrand 1000.
    - e. Nycon, Inc.; ProCon-M.
    - f. Propex; Fibermesh 150.
    - g. QC Construction Products; QC FIBERS.
    - h. Sika Corporation; Sika Fiber HP.
- B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Euclid Chemical Company (The); an RPM company; PSI Fiberstrand F.
  - b. FORTA Corporation; FORTA Econo-Net.
  - c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Fibers.
  - d. Nycon, Inc.; ProCon-F.
  - e. Propex; Fibermesh 300.
  - f. Sika Corporation; Sika Fiber PPF.

## 2.6 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. BASF Corporation-Construction Systems; MasterKure ER 50 (Pre-2014: Confilm.
  - b. Bon Tool Co.; 32-301-B7 BonWay Evaporation Retarder.
  - c. Brickform; a division of Solomon Colors; Evaporation Retarder.
  - d. ChemMasters, Inc; Spray-Film.
  - e. Dayton Superior; AquaFilm Concentrate J74.
  - f. Euclid Chemical Company (The); an RPM company; Eucobar.
  - g. Kaufman Products, Inc; VaporAid.
  - h. L&M Construction Chemicals, Inc; E-CON.
  - i. Lambert Corporation; LAMBCO Skin.
  - j. Metalcrete Industries; Waterhold.
  - k. Nox-Crete Products Group; MONOFILM.
  - l. Sika Corporation; SikaFilm.
  - m. SpecChem, LLC; SpecFilm.
  - n. TK Products; TK-2120 TRI-FILM.
  - o. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Anti-Hydro International, Inc; A-H Curing Compound #2 DR WB.
  - b. ChemMasters, Inc; Safe-Cure Clear DR.
  - c. Dayton Superior; Clear Resin Cure J11W.
  - d. Euclid Chemical Company (The); an RPM company; Kurez DR VOX.
  - e. Kaufman Products, Inc; DR Cure.
  - f. L&M Construction Chemicals, Inc; L&M CURE R.
  - g. Lambert Corporation; AQUA KURE - CLEAR.
  - h. Nox-Crete Products Group; Res-Cure DH.
  - i. Right Pointe; Clear Water Resin.
  - j. SpecChem, LLC; PaveCure Rez.

- k. TK Products; TK-2519 DC WB.
- l. Unitex by Dayton Superior; Hydroseal 18.
- m. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.
- n. W.R. Meadows, Inc; 1100-CLEAR SERIES.

## 2.7 RELATED MATERIALS

- A. Joint Fillers: Form expansion joint meeting ASTM D545-05, ASTM D3575 and ASTM 545-00 and ASTM 04819 Type II.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.8 DETECTABLE WARNING MATERIALS

- A. Truncated Dome Pavers: 23 inch by 12 inch (304 by 304 mm), 6000 psi.

## 2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Pozzolan: 25 percent.
  - 2. Slag Cement: 50 percent.
  - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).
- D. Concrete Mixtures: Normal-weight concrete.
  - 1. Compressive Strength (28 Days): 3500 psi (24.1 MPa).
  - 2. Maximum W/C Ratio at Point of Placement: 0.45.

## 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
  - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
  - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

## 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

## 3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Joints shall be as close as possible to 90° at edge of slab. In no stance shall joints create acute angles at less than 45°.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of as indicated on drawings.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as shown on drawings:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/2-inch (12.7-mm) radius. Repeat grooving of contraction joints after applying surface finishes.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/2-inch (12.7-mm) radius. Repeat tooling of edges after applying surface finishes.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.
- D. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement joint devices.
- G. Screed paving surface with a straightedge and strike off.
- H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- I. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.8 DETECTABLE WARNING INSTALLATION

- A. See Section 321400 – Unit Paving

### 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

## 3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long; unlevelled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

## 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no

compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.12 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

## SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Cold-applied joint sealants.
  - 2. Primers.
- B. Related Requirements:
  - 1. Section 321373 "Concrete Paving Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Paving-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of joint sealant and accessory.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

## 1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

## 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

## 2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Crafcoc Inc; RoadSaver Silicone.
    - b. Dow Corning Corporation; Dow Corning® 888 Silicone Joint Sealant.
    - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Crafcoc Inc; RoadSaver Silicone SL.
    - b. Dow Corning Corporation; Dow Corning® 890-SL Silicone Joint Sealant.
    - c. Pecora Corporation; 300 SL.

## 2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

- B. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

## 2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
  - 1. Place joint sealants so they fully contact joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
  - 1. Remove excess joint sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

#### 3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
  
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

## SECTION 321400 - UNIT PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Concrete pavers set in mortar beds on concrete.
- B. Related Requirements:
  - 1. Section 321313 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete ribbon edge restraints for unit pavers.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Pavers.
  - 2. Mortar and grout materials.
  - 3. Edge restraints.
- B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- C. Samples for Initial Selection: For each type of unit paver.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

## 1.7 FIELD CONDITIONS

- A. Weather Limitations for Mortar and Grout:
  - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
  - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
    - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set pavers within 1 minute of spreading setting-bed mortar.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

## 2.2 CONCRETE PAVERS

- A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936/C 936M, made from normal-weight aggregates.
  - 1. Manufacturers: Subject to compliance with requirements. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

## a. Belgard

2. Thickness: 3-1/8 inches (80 mm).
3. Face Size and Shape: 3-7/8-by-7-7/8-inch (98-by-200-mm) rectangle.
4. Face, Size and Shape: 6 inches by 6 inches, square.
5. Color: As selected by Architect from manufacturer's full range.
6. Exposed Aggregate: Exposed Shell

## 2.3 CURBS AND EDGE RESTRAINTS

- A. Job-Built Concrete Edge Restraints: Comply with requirements in Section 321313 "Concrete Paving" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi (20 MPa).

## 2.4 MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144.
- D. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
- E. Thin-Set Mortar for Bond Coat: Latex-portland cement mortar complying with ANSI A118.4.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ARDEX GmbH;
    - b. Boiardi Products Corporation; a QEP company;
    - c. Bonsal American, an Oldcastle company;
    - d. Bostik, Inc;
    - e. C-Cure;
    - f. Custom Building Products;
    - g. Jamo Inc;
    - h. Laticrete International, Inc;
    - i. MAPEI Corporation;
    - j. Parex USA, Inc.;
    - k. ProSpec; an Oldcastle company;
    - l. Southern Grouts & Mortars, Inc;
    - m. Summitville Tiles, Inc;
    - n. TEC; H.B. Fuller Construction Products Inc.;
  2. Provide product that is approved by manufacturer for application thickness of 5/8 inch (16 mm).

## 2.5 WATER: POTABLE

## 2.6 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed of uniform quality and with optimal performance characteristics. Discard mortars if they have reached their initial set before being used.
- B. Mortar-Bed Bond Coat: Mix neat cement and latex additive to a creamy consistency.
- C. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.
- D. Latex-Modified, Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and liquid latex for bond coat to comply with written instructions of liquid-latex manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance. Use of curing and sealing compounds on surfaces to be covered by unit pavers set in mortar is prohibited.
- B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

## 3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.
- D. Joint Pattern: Running bond and solder course.
- E. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) for finished surface of paving.
- F. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."
- G. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
  1. Install job-built concrete edge restraints to comply with requirements in Section 033000 "Cast-in-Place Concrete."

#### 3.4 MORTAR SETTING-BED APPLICATIONS

- A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Do not exceed 1/16-inch (1.6-mm) thickness for bond coat. Limit area of bond coat to avoid its drying out before placing setting bed.
- C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- D. Place mortar bed with reinforcing wire fully embedded in middle of mortar bed. Spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- E. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.
- F. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch- (1.5-mm-) thick bond coat to mortar bed or to back of each paver with a flat trowel.
- G. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.
- H. Spaced Joint Widths: Provide 1/4-inch (6.4-mm) nominal joint width with variations not exceeding plus or minus 1/16 inch (1.5 mm).

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

END OF SECTION 321400

## SECTION 321723 - PAVEMENT MARKINGS

## PART 1 - GENERAL

## 1.01 SCOPE

- A. This section specifies the pavement traffic painting, marking, striping, and signing shown on the plans or called for in the test of the specifications.

## 1.02 GENERAL

- A. In general, all pavement traffic painting, marking, striping, and signing shall comply with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 1991, latest revision, hereafter referenced "FDOTSPEC" and the Manual of Uniform Traffic Control Devices, U.S. Department of Transportation Federal Highway Administration, 1971 or latest revision, hereafter referenced as "MUTCD."

## 1.03 SIGN PANELS AND POSTS

- A. Sign panels shall be aluminum. All sign posts shall be frangible aluminum and shall have a standard extruded aluminum sign bracket clamped to the post 12 inches below grade. Bracket size shall match post diameter.

## 1.04 SIGN BLANKS AND FACES

- A. Regulatory and Warning signs as defined in the MUTCD shall be "High Intensity" reflectorized grade.
- B. Street Name and Guide signs as defined in the MUTCD shall be "Standard reflectorized grade."
- C. The Contractor shall submit documentation from the sign supplier which identifies the reflector grade of each sign. All materials shall meet the requirements of FDOTSPEC.

## 1.05 SIGN HARDWARE

- A. The signs shall be attached to the posts with vandal-resistant nuts and carriage bolts with washers. Vandal-resistant nuts shall be Tufnut, Tamper-Pruf, Vandal-Pruf, or approved equal. The nuts and bolts shall be manufactured from high strength aluminum. Button head bolts shall not be used.

## 1.06 PAVEMENT STRIPING AND PAINTING

- A. Temporary Painting Traffic Stripes. Temporary Painted pavement striping shall conform to FDOTSPEC, Section 710. (For use on-site)
- B. Final Thermoplastic Striping & Marking. Final Thermoplastic pavement striping shall be reflective and shall conform to FDOTSPEC, Section 711. (For use within the rights-of-way)

## 1.07 REFLECTIVE PAVEMENT MARKERS

- A. Reflective pavement markers and their installation shall conform to FDOTSPEC, Section 706.

1.08 BASIS OF PAYMENT

- A. Payment for pavement marking, striping, and signing shall be on a lump sum basis in accordance with the accepted proposal. Such payment shall constitute full compensation for furnishing all labor, materials, and equipment necessary to complete the construction in accordance with the plans and specifications. The Owner reserves the right to add to or deduct from the scope of the work, and such additions or deductions will be made at the unit price established in the proposal. The said additions or deductions shall not exceed twenty-five percent (25%) of the base bid of the successful bidder or bidders unless otherwise noted.

PART 2 – PRODUCTS

PART 3 - EXECUTION

END OF SECTION 321723

## SECTION 321726 - TACTILE WARNING SURFACING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Detectable warning unit pavers.
- B. Related Requirements:
  - 1. Section 321313 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.
  - 2. Section 321400 "Unit Paving" for unit paving installations incorporating detectable warning unit pavers specified in this Section.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.
- C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

## 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
  - 1. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
    - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set unit pavers within 1 minute of spreading setting-bed mortar.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering and wear.
    - b. Separation or delamination of materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for tactile warning surfaces.
  - 1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

- B. Source Limitations: Obtain each type of tactile warning surfacing, from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

## 2.2 DETECTABLE WARNING UNIT PAVERS

- A. Detectable Warning Concrete Unit Pavers: Solid paving units, made from normal-weight concrete with a compressive strength of not less than 5000 psi (34 MPa), water absorption of not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67, with accessible detectable warning truncated domes on exposed surface of units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. ECG, Inc.; a division of Elizabeth City Glass Co.
  - b. Tile-Tech Pavers.
  - c. Belgard
2. Shapes and Sizes:
  - a. Thickness: 2-3/8 inches (60 mm).
  - b. Face Size: Nominal 4 by 8 inches (101 by 203 mm).
3. Dome Spacing and Configuration: Manufacturer's standard compliant spacing, in square pattern.
4. Color: As selected by Architect from manufacturer's full range.
5. Finish: Exposed shell finish.

- B. Setting Bed: Comply with requirements in Section 321400 "Unit Paving."

- C. Mortar Setting Bed:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
2. Sand: ASTM C 33/C 33M.
3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
4. Thinset Mortar: Latex-modified portland cement mortar complying with ANSI A118.4.
5. Water: Potable.

## 2.3 ACCESSORIES

- A. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.
- B. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION OF DETECTABLE WARNING UNIT PAVERS

## A. Unit Paver Installation, General:

- 1. Setting-Bed and Unit Paver Installation: Comply with installation requirements in Section 321400 "Unit Paving."
- 2. Mix unit pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- 3. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
- 4. Tolerances: Do not exceed 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.

## B. Mortar Setting-Bed Applications:

- 1. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- 2. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch (1.6-mm) thickness for bond coat.
- 3. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- 4. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.
- 5. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch- (1.5-mm-) thick bond coat to mortar bed or to back of each paver with a flat trowel.
- 6. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.
- 7. Spaced Joint Widths: Provide 3/8-inch (10-mm) nominal joint width with variations not exceeding plus or minus 1/16 inch (1.5 mm).

## 3.3 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

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- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 321726

## SECTION 321816.10 - INTERACTIVE WATER FEATURE PROTECTIVE SURFACING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."
- C. Scope: These are the manufacturer's specifications for the AquaFlex® Non-Porous Surfacing System.
- D. Description: AquaFlex Non-Porous troweled at 3/8" over concrete or over a cushioned layer of SBR and/or SBR and foam is a non-porous thermoplastic aliphatic rubber designed to be used in the surfacing of concrete, asphalt, metal and fiberglass. It will bond to most surfaces and will flex with surface movements. It has been designed to hold up to weather and chlorine.
- E. Work: Provide all necessary materials, labor, tools and equipment to perform the work included in the section for the installation of the resurface.
- F. The installation of the new surface shall be completed by Landscape Structures certified installers. Manufacturer's detailed installation procedures shall be submitted to the architect and made part of the bid specifications.
- G. Temperature must remain above 50-degrees Fahrenheit throughout the installation and curing process. Weather and surface must be dry, and there should be no rain in the immediate forecast.
- H. Site must be made secure against vandalism during installation and curing period.

## 1.2 SUBMITTALS

- A. Manufacturer's Product Literature and Specification Data.
- B. ASTM C 1028-07 Skid Resistance Test.
- C. Manufacturer's written instructions for recommended maintenance practices.
- D. Color samples for customer verification.

- E. Written statement on Manufacturer's letterhead certifying that the top surface will be light stable for a period of three (3) years from date of installation.
- F. Written manufacturer's warranty for water play.
- G. Product liability insurance certificate with project owner as certificate holder.
- H. MSDS for items in Part 2 "Products."
- I. ASTM F 1292 – If critical fall height is required, attenuation test results shall be submitted by the installer to the requiring agency prior to installation of the surface. The results shall be submitted on the letterhead of the independent testing lab. Impact attenuation results will need to comply with ASTM F 1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment for the critical fall height of the equipment.

## PART 2 - PRODUCTS

- 2.1 Product: AquaFlex Non-Porous Surfacing System.
- 2.2 Materials: AquaFlex HC, 100% solids, two-component aliphatic polyurethane Binder/Primer; a combination of 50% AquaFlex aliphatic thermoplastic large pebbles and 50% small pebbles.
- 2.3 Impact Layer: The impact layer is to be made of a composite of foam and SBR rubber or SBR rubber alone. The foam material shall be 100% recycled cross-linked, closed-cell polyethylene foam that is heat-sealed together. The SBR rubber is to be a 50/50 blend of short strand and granular. The binder to be used is AquaFlex single component aromatic polyurethane Binder/Primer.
- 2.4 Equal Materials: The AquaFlex pebbles are thermoplastic aliphatic polyurethane. The system is 100% color. The AquaFlex HC Binder/Primer is a two-part aliphatic, chlorine-resistant polyurethane. Any equal product granule or pebble must be aliphatic polyurethane based; not rubber based such as EPDM, TPV, polyolefin-based TPE; must include a two-part aliphatic polyurethane binder proven to be chlorine resistant and must be 100% color. Recycled black material is not acceptable. Additionally, any equal product must be non-porous, and where applicable, approved by the local board of health.
- 2.5 Finish Texture: Rough grain non-skid finish.
- 2.6 Color: Selected from Manufacturer's color chart by owner prior to bid.

## PART 3 - EXECUTION

- 3.1 Surface Preparation
  - A. New or Existing Concrete: New concrete must be at least 28 days old. All concrete must be acid etched. Add acid slowly to water in clean polyethylene buckets at a ratio of eight parts water to one part acid. Care should be taken to prevent splashing on workers. Protective clothes such as safety glasses, rubber gloves and boots should be used. The acid solution should be applied on the surface at a rate of 100 square feet per 5 gallons of acid solution. Using a stiff broom, scrub acid solution onto the surface where the solution was poured and continue the process to other

areas. Never let the surface dry with acid on it. After 5 minutes, rinse the surface with large amounts of clean water to remove all the acid solution, and then allow the surface to dry. Old concrete that is contaminated with grease or oil can be cleaned with a power-washer. Use a degreasing agent before power-washing. For concrete where a power-washer cannot be used, a diamond grinder can be used to lightly grind the surface to remove contamination.

- B. Metal Preparation: All metal surfaces must be rigid and structurally sound. Contamination such as grease, oil and dirt must be removed prior to coating. Rust or scale should be removed through mechanical means such as sanding or sand-blasting. The surface should be abraded until bright metal is showing. If the surface is to be exposed for an extended period of time, it should be treated with a 10% phosphoric acid solution to prevent new rust formation.
- C. Tile Preparation: Any unstable or loose tile must be removed. Contamination should be removed with a power-washer or mechanically abraded. Any glazing on tile must be abraded off with a grinder or shot blaster.
- D. Fiberglass Preparation: Power-wash any contaminants off the surface. Allow 24 hours for the surface to dry. Glaze coating must be abraded or sanded. Solvent wipe the fiberglass surface before coating with primer.
- E. Asphalt Preparation: New asphalt must be 15 days old. Broom scrub using a degreaser to remove any surface oils. Power-wash any contaminants off the surface. Allow 24 hours for the surface to dry. AQUAFLEX CANNOT BE INSTALLED OVER ASPHALT CURED FOR LESS THAN 15 DAYS.
- F. Curb Preparation: Cut a 3/8" x 1" keyway groove into the existing surrounding curbing. Groove shall be swept clean and be free of all residual residue.
- G. Drains, Ground Pop Jets, Doorways/Entryways: Cut a 3/8" x 1" keyway groove into the concrete surrounding the object. Groove shall be swept clean and be free of all residual residue.

### 3.2 INSTALLATION

- A. Forming: Following the shape of the area to be surfaced, form out the area with 1" x 4" wood strips or for curved concrete use plywood cut into 4" strips. Stabilize the wood with spikes or stakes and thoroughly wax the wood surfaces with carnauba wax.
- B. Impact Cushion Layer: The impact layer is to be made of a composite of foam and SBR rubber or SBR rubber alone. The foam material shall be 100% recycled cross-linked, closed-cell polyethylene foam that is heat-sealed together. The SBR rubber is to be a 50/50 blend of strand and granular.
- C. The manufacturer's minimum depth or greater shall be installed as required by the fall height(s) required by the water play equipment that exists or is to be installed and to meet the test results of the finished surface as expressly required within this specification. If no fall height protection is required, a minimum depth of 5/8" of SBR rubber will be applied as the cushion layer.
  - 1. Foam: The foam panels should be laid out in accordance with the splash pad design including the appropriate use zone. Cut the foam to fit around the legs of the equipment. Leave a gap of 1" between all the panels during the installation. Over concrete, adhere the foam to the sub-base using AquaFlex® two-part epoxy primer. Over the foam, prime the

surface using AquaFlex single component binder/primer cut with 5% xylene. Apply a minimum of 1 1/8" of SBR Buffings over the top of the foam panels creating a consistent and even surface.

2. SBR Buffings: Over concrete, adhere the SBR to the concrete by applying a coat of AquaFlex single component aromatic polyurethane binder diluted with 5% xylene over the entire surface. Over foam panels, adhere the SBR to the foam by applying a coat of the above AquaFlex binder mixture over the entire surface. For surrounding curbing, prime the vertical surface of the curb using the above binder/primer mixture. Mix two 50-pound bags of SBR buffings (50/50 short strand/granular mix) with 8 quarts of AquaFlex single component aromatic polyurethane binder so that the buffings are covered evenly. Spread the mix and trowel to the appropriate depth immediately after the application of the primer. Against curbing taper the SBR at a 45-degree angle so that the mixture is no less than 1" lower than the keyway cut in the curbing. Let cure.

- D. Sealing: Premix AquaFlex HC aliphatic two-component Binder/Primer in a plastic pail with a paddle mixer and add 2 times the volume of primer of calcium carbonate to thicken the liquid to a paste consistency. Pour the entire mixture onto surface in a tight line. Using a hand float rubber squeegee pull the material over the surface making sure to cover the entire surface filling all voids, or use rubber hand squeegee to cover the surface filling all voids. Let cure until tack free.

- E. AquaFlex Mixing and Finishing: Mix a ratio of 50 pounds large pebbles to 50 pounds of small pebbles creating 100 pounds of AquaFlex pebbles in a mortar mixer. Pre-mix 2.14 gallons of AquaFlex HC aliphatic two-component binder in an appropriate plastic container with a paddle mixer. Add the premixed 2.14 gallons of binder to the pebbles in the mortar mixer. Mix thoroughly so that all pebbles are covered evenly. Dump the mix onto the area and spread it with a cam rake or screed box at a thickness of 7/16". Fresno the area keeping the surface as level as possible. Hand or power-trowel the surface using a solution of AquaFlex Trowel Slick to lubricate the surface of the trowel. This will allow easier manipulation of the trowel. Do not use water on the surface as a troweling aid. The compounded mixture will compress to approximately 3/8". Let the surface set for 72 hours.

### 3.3 CLEANING

- A. The contractor should clean the job site of excess materials.
- B. The contractor shall instruct the owner's personnel on proper maintenance and repair of the AquaFlex surface.

### 3.4 SPECIAL CONSIDERATIONS

- A. Coated Concrete—For a coated concrete surface, diamond grind or power-scarify as required to obtain optimum bond of the AquaFlex material to the concrete. Remove sufficient coated material to provide a sound surface, free of glaze, efflorescence, or from release agents. Remove grease, oil, and other penetrating contaminants. Remove and/or replace any loose or unstable concrete. Concrete will have a pitch of 0.25 inches per foot and should not have low areas that will hold water under the system.
- B. Existing Caulk-filled Edges—Prepare edges of existing splash pad to meet surrounding concrete. Remove any and all silicone or caulking where the splash pad and the surrounding

concrete meet. Cut a groove into the surrounding concrete 1" deep by 1" wide located 1" beyond the current layout where the concrete splash pad meets the surrounding concrete.

- C. Existing Ground Spray Features— Prepare the spray jets submerged into the existing splash pad by cutting a 3/8" x 1" keyway. Remove all concrete adhered to the existing sides of the spray jets. Solvent-wipe the spray jets to remove any contaminants.
- D. Existing Drains— Prepare the drains submerged into the existing splash pad by cutting a 3/8" x 1" keyway. Remove all concrete adhered to the existing sides of the drains. Solvent-wipe the drains to remove any contaminants. Drill 1/2" weep holes at a 45-degree angle into the sides of the drains.

### 3.5 WARRANTY

- A. 3-year limited warranty on manufacturing defects.

### 3.6 MAINTENANCE

- A. As with any surface exposed to high traffic, regular cleaning helps to maintain a vibrant and attractive surface. AquaFlex is not only highly resistant to ultraviolet rays and chemicals, but it also stands up to 2,800 psi powerwashing, and/or high-temperature (up to 180-degrees Fahrenheit maximum) pressure washing. The following cleaning agents should not be used on your AquaFlex surface: gasoline, diesel fuel, naphtha, benzene, acids, turpentine, mineral spirits, carbon tetrachloride, WD-40 and all other petroleum distillates

END OF SECTION 321816.10

## SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."
- C. Section 312300 "Excavation and Fill"
- D. Section 321313 "Concrete Paving"

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Unitary, seamless surfacing.

## 1.3 DEFINITIONS

- A. Definitions in ASTM F 2223 and F1951 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F 2223; same as "critical fall height" in ASTM F 1292. According to ASTM F 1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."
  - 1. Confirm surfacing thickness with playground manufacturer.
- C. SBR: Styrene-butadiene rubber.
- D. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface; same as "unitary system" in ASTM F 2223.

## 1.4 RELATED REQUIREMENTS

- A. Section 328400 "Irrigation System"
- B. Section 329113 "Soil Preparation"

- C. Section 329300 "Plants"

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of protective surfacing.
  - 1. Include plans, sections, placement and penetration details, and attachment to substrates.
  - 2. Include accessories and edge terminations.
  - 3. Include patterns made by varying colors of surfacing and details of graphics.
- C. Samples for Initial Selection: For each type of exposed finish.
  - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of protective surfacing and exposed finish.
  - 1. Include Samples of accessories to verify color and finish selection.
  - 2. Unitary, Seamless Surfacing: Minimum 6 by 6 inches (150 by 150 mm).

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
  - 1. Pebble Flex/Landscape Structures, certified installers.
- B. Material Certificates: For each type of loose-fill surfacing.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranty.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.
- B. Written instructions on applying clear two-part Aliphatic Polyurethane.

#### 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Loose Fill: Amount equal to 1 percent of amount installed, by color.

#### 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - 1. Pebble Flex/Landscape Structures, certified installers.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for materials and execution.
  - 1. Build mockups for protective surfacing including accessories.
    - a. Size: 48 inches (1200 mm) by 48 inches (1200 mm).
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Reduction in impact attenuation as measured by reduction of critical fall height.
    - b. Deterioration of protective surfacing and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Final Acceptance.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials, including loose-fill accessories, from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F 1292.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F 1951.

#### 2.3 UNITARY, DUAL-DENSITY, SEAMLESS SURFACING

- A. Description: Manufacturer's standard, site-mixed and applied, two-layer material with wearing layer over cushioning layer, with combined, overall thickness as required, tested for impact attenuation according to ASTM F 1292 and for accessibility according to ASTM F 1951.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Pebble Flex by Landscape Structures.
  - 2. Wearing Layer: Formulation of two size aliphatic 1-1/8" thick polyurethane spheres and two components aliphatic polyurethane binder.
  - 3. Cushioning Layer: Formulation of SBR particles and binder.

4. Binder: Weather-resistant, UV-stabilized, flexible, nonhardening, 100 percent solids polyurethane.
  5. Form Layer: Recycle closed cell; depth varies depending on fall height requirement.
  6. Abrasion resistant porous.
  7. Lacquer Topcoat: Two part aliphatic polyurethane clear coat.
  8. Critical Height: Up to 12 feet (3.7 m).
  9. Overall Thickness: As indicated on Drawings and required by playground manufacturer.
  10. Primer/Adhesive: Manufacturer's standard primer and weather-resistant, moisture-cured polyurethane adhesive suitable for unit, substrate, and location.
  11. Wearing Layer Color(s): As selected by Architect from manufacturer's full range.
    - a. Design: Where colored pattern and graphic design is required, provide as indicated on Drawings.
- B. Leveling and Patching Material: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by protective surfacing manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.
  1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
  2. Verify mounding/aesthetic. Mounding is per the Civil drawings.
  3. Verify irrigation is stubbed in per Irrigation Drawings.
- B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary, protective surfacing installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to protective surfacing manufacturer's written requirements for cross-section profile.
  1. Concrete Substrates: Verify that substrates are dry and free from surface defects, laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with protective surfacing or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by protective surfacing manufacturer.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Provide 6' diameter holes in substrate for palms. See Landscape Drawings for location.
- B. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

- C. Hard-Surface Substrates: Clean surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with protective surfacing.
  - 1. Repair: Fill holes and depressions in unsatisfactory surfaces with leveling and patching material.
  - 2. Treatment: Mechanically abrade or otherwise prepare concrete substrates according to protective surfacing manufacturer's written instructions to achieve adequate roughness.
  - 3. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through protective surfacing.

### 3.3 MISCELLANEOUS INSTALLATION

- A. After installation of substrate. Install landscaping per Landscape Drawings.
- B. Install root watering system apparatus per Irrigation Drawings and specifications

### 3.4 INSTALLATION OF SEAMLESS SURFACING

- A. Mix and apply components of seamless surfacing according to manufacturer's written instructions to produce uniform, monolithic, and impact-attenuating protective surfacing of required overall thickness.
  - 1. Substrate Primer: Apply over prepared substrate at manufacturer's standard spreading rate for type of substrate.
  - 2. Poured Cushioning Layer: Spread evenly over primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.
  - 3. SBR Layer: Spread evenly over primed cushion layer to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation with a minimum of cold joints.
  - 4. Intercoat Primer: Over cured cushioning layer, apply primer at manufacturer's standard spreading rate.
  - 5. Wearing Layer: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except where color changes, with no cold joints. Finish surface to produce manufacturer's standard wearing-surface texture.
    - a. Design: Where colored pattern and graphic design is required, place colored, design material as soon as previously placed material is sufficiently cured, using primer or adhesive if required by manufacturer's written instructions.
  - 6. Lacquer Topcoat: Spray or roller applied at manufacturer's standard coating rate in one continuous operation.
  - 7. Edge Treatment: As indicated on Drawings. Fully adhere edges to substrate with full coverage of substrate. Maintain fully cushioned thickness required to comply with performance requirements.
    - a. Edge of safety surface shall be flush with adjacent sidewalks.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Perform the following tests with the assistance of a factory-authorized service representative:
  - 1. Perform "Installed Surface Performance Test" according to ASTM F 1292 for each protective surfacing type and thickness in each playground area.
  - 2. Perform installed-surface-performance tests at no less than one series of tests for each 1000 sq. ft. (100 sq. m) of each type and thickness of in-place protective surfacing or part thereof.
- C. Playground protective surfacing will be considered defective if it does not pass tests.
- D. Prepare test reports.

3.6 PROTECTION

- A. Prevent traffic over seamless surfacing for not less than 48 hours after installation.

END OF SECTION 321816.13

## SECTION 323119 - DECORATIVE METAL FENCES AND GATES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Decorative aluminum fences.
  - 2. Swing gates.
- B. Related Requirements:
  - 1. Section 321313 "Concrete Paving" for concrete post concrete fill.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each fence material and for each color specified.
  - 1. Provide Samples 12 inches (300 mm) in length for linear materials.
  - 2. Provide Samples 12 inches (300 mm) square for bar grating and sheet or plate materials.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Include 10-foot (3-m) length of fence complying with requirements.

## PART 2 - PRODUCTS

### 2.1 DECORATIVE ALUMINUM FENCES

- A. Decorative Aluminum Fences: Fences made from aluminum extrusions.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Alumi-Guard, Inc.
    - b. Ameristar Fence Products.
    - c. Carfaro, Inc.
    - d. Delair Group, L.L.C.
    - e. East & West Alum Craft Ltd.
    - f. Elegant Aluminum Products, Inc.
    - g. Elite Fence Products, Inc.
    - h. Ideal Aluminum Products.
    - i. Iron Eagle Industries, Inc.
    - j. Japra Group International.
    - k. Jerith Manufacturing Company, Inc.
    - l. Master Halco.
    - m. Merchants Metals.
    - n. Royal Aluminum and Steel, Inc.
    - o. Specrail.
    - p. Superior Aluminum Products, Inc.
    - q. Tek-Rail.
    - r. Ultra Aluminum Mfg., Inc.
    - s. Virginia Railing and Gates, LLC.
- B. Posts: Square extruded tubes.
  - 1. Line Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.125 inch (3.18-mm) wall thickness.
  - 2. End and Corner Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.125 inch (3.18-mm) wall thickness.
  - 3. Swing Gate Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.250 inch (6.35-mm) wall thickness.
  - 4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): 4 by 4 inches (101.6 by 101.6 mm) with 0.250 inch (6.35-mm) wall thickness.
  - 5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): 12 by 12 inches (304.8 by 304.8 mm) with 0.250 inch (6.35-mm) wall thickness.
  - 6. Guide Posts for Class 1 Horizontal-Slide Gates: 3 by 3 inches (76 by 76 mm) with 0.125-inch (3.18-mm) wall thickness; installed adjacent to gate post to permit gate to slide in space between.
- C. Post Caps: Aluminum castings that cover entire top of posts.

- D. Rails: Extruded-aluminum channels, 1-1/4 by 1-1/4 inches (32 by 32 mm), with 0.078-inch- (1.98-mm-) thick sidewalls and 0.062-inch- (1.57-mm-) thick top.
- E. Pickets: Extruded-aluminum tubes, 1 inch (25 mm) square, with 0.062-inch (1.57-mm) wall thickness.
  - 1. Terminate tops of pickets at top rail for flush top appearance.
  - 2. Picket Spacing: 4 inches (101.6 mm), maximum. A 4 inch (101.6 mm) diameter ball shall not fit between pickets.
- F. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.
- G. Fabrication: Assemble fences into sections by welding pickets to rails.
  - 1. Fabricate sections with clips welded to rails for field fastening to posts.
  - 2. Drill clips for fasteners before finishing.
- H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- I. Finish: Baked enamel or powder coating.

## 2.2 SWING GATES

- A. Gate Configuration: As indicated.
- B. Gate Frame Height: As indicated.
- C. Gate Opening Width: As indicated.
- D. Automated vehicular gates shall comply with ASTM F 2200, Class II.
- E. Frame Corner Construction: Welded and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- F. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- G. Infill: Comply with requirements for adjacent fence.
- H. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
  - 1. Treillage: Provide iron castings of pattern indicated between each pair of pickets. Finish as specified for gates.
- I. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- J. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.

1. Function: 39 - Full surface, triple weight, antifriction bearing.
  2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.
- K. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.
1. Function: 626 - Interlocking deadbolt operated by key from either side
  2. Material: Cast, forged, or extruded brass or bronze.
  3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.
- L. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.
1. Function: F16 - Double-cylinder deadlock or F17 - Deadlock.
  2. Material: Brass or bronze.
  3. Levers: Cast, forged, or extruded brass or bronze.
  4. Mounting Box: Configuration necessary to enclose locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.
- M. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 3/4-inch- (19-mm-) diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in closed position.
- N. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- O. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- P. Aluminum Finish: Baked enamel or powder coating.
- 2.3 HORIZONTAL-SLIDE GATES
- A. Gate Configuration: Double leaf.
1. Type: Overhead slide.
  2. Type: Cantilever slide, with internal roller assemblies.
- B. Gate Frame Height: 72 inches (1830 mm).
- C. Gate Opening Width: As indicated.
- D. Automated vehicular gates shall comply with ASTM F 2200, Class II.
- E. Aluminum Frames and Bracing: Fabricate members from square tubing.
1. Frame Members: Extruded-aluminum 2-1/2 by 2-1/2 inches (64 by 64 mm) with 0.154-inch (3.91-mm) wall thickness.
  2. Bracing Members: Extruded-aluminum tubes 1-1/2 by 1-1/2 inches (38 by 38 mm) with 0.154-inch (3.91-mm) wall thickness.
- F. Frame Corner Construction:

1. Welded frame with panels assembled with bolted or riveted corner fittings and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
  2. Overhead Slide Gates: Welded or assembled with corner fittings including 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- G. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- H. Infill: Comply with requirements for adjacent fence.
- I. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
- J. Hardware: Latches permitting operation from both sides of gate, locking devices and roller assemblies and stops fabricated from mill-finished, Grade 319 aluminum-alloy casting with stainless-steel fasteners. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- K. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- L. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- M. Aluminum Finish: Baked enamel or powder coating.

#### 2.4 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- C. Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
- D. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

#### 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.

- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

## 2.6 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
  - 1. Construction layout and field engineering are specified in Section 017300 "Execution."

### 3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences by setting posts as indicated and fastening rails and infill panels to posts. Peen threads of bolts after assembly to prevent removal.
- B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches (600 mm) plus 3 inches (75 mm) for each foot (300 mm) or fraction of a foot (300 mm) that fence height exceeds 4 feet (1.2 m).
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

- a. Concealed Concrete: Top 12 inches (304.8 mm) below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.
3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.
4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
  - a. Extend posts at least 5 inches (125 mm) into sleeve.
  - b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch (20 mm) larger than outside diagonal dimension of post.
  - a. Extend posts at least 5 inches (125 mm) into concrete.
  - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
6. Space posts uniformly at 8 feet (2.44 m) o.c.

### 3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

### 3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 323119

## SECTION 328400 - IRRIGATION SYSTEM

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SECTION INCLUDES

- A. Landscape irrigation system including all necessary accessories in affected areas and as specified in this section.
- B. Provisions for labor, materials, equipment, transportation machinery and services and incidentals necessary to complete the irrigation work, as indicated on the drawings, as specified herein or both, including all changes and incident repairs.
- C. The completed and proper installation of the irrigation system, including but not limited to:
  - 1. Piping, including mains, laterals, fittings, sleeves, connections, tees, thrust blocks, swing joints, and other accessories.
  - 2. Control, gate, globe, pressure reducing, quick coupling, air relief, and other valves including valve boxes, markers, connections, operators, and other accessories.
  - 3. Complete automatic control system including controllers, decoders, control wiring, wire conduit, connections to electrical supply, grounding, and water conservation equipment.
  - 4. All sprinklers including proper nozzles as called for herein and as shown on the plans, and all other appurtenances and accessories for proper operation.
  - 5. Pump station and underground storage tank.
  - 6. Connections of piping to the supply source as required.
  - 7. Backflow prevention in accordance with local codes to meet requirements for cross connection control.
  - 8. All excavation, site work, relocation or replacement of utilities, backfill and restoration of all disturbed areas. The root systems of each existing trees shall be protected.

9. Supply, deliver, store and protect all equipment and materials including pipe and fittings, sprinkler heads, valves, controllers, wire, and other component parts necessary for the installation of a fully automatic irrigation system.
10. Adjustment of head location, type and size, and any other system components to comply with the requirements of landscaping as actually installed.
11. Provide adequate security of materials on site.

D. Related Sections:

1. 329113 – Soil Preparation
2. 329200 – Turf and Grasses
3. 329300 – Plants
4. Transplanting: See Sheet LT-07

E. Investigation of Subsurface Conditions:

1. The Contractor shall be responsible for making site subsurface investigations and examinations as he chooses in order to determine the character of the existing material and the construction conditions under which he will work.
2. No separate, additional compensation will be granted because of any unusual difficulties which may be encountered in the execution of any portion of the work.

F. The Plans are not complete unless accompanied by these specifications.

### 1.1 QUALITY ASSURANCE

- A. Applicable ANSI, ASTM, FED. Spec. Standards and Specifications, and applicable building codes and other public agencies having jurisdiction on the work.
- B. Install the system in accordance with local codes, ordinances, and laws.
- C. Replace all trees, plants, turf or any structure damaged or disrupted during the installation. Damage to the root systems of existing trees shall be minimized.
- D. Prevent foreign materials such as concrete, mortar mix, limerock, grease, oils, etc., from mixing with native soil except as specified herein.
- E. Obtain permits and pay required fees to governmental agencies having jurisdiction over the work. Inspections required by local ordinances or codes shall be arranged as required.
- F. Work shall be guaranteed for one year from date of acceptance against all defects in materials, equipment, and workmanship. Repairs, if required, shall be performed promptly.
- G. Installer qualifications: Have satisfactorily installed acceptable underground sprinkler systems on at least ten (10) other projects of comparable complexity. Provide Owner/Client/General Contractor/Architect of record names, postal address, phone, fax, email address and photographs of such projects. All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to

them. The Contractor shall be responsible for maintaining the quality of the material on the project.

- H. Correct Grade or Quality of Materials: Any supplier of materials misrepresenting the grade or quality of their materials (i.e. a higher grade than they are), as determined in the contract documents, shall not be allowed to supply any material for this project. All material already supplied and received from such a supplier shall be removed and replaced at no additional cost to the Owner. This requirement for removal and replacement shall also include installed materials. No further material will be accepted from such supplier until written evidence is submitted and confirmed that all material for delivery is of the grade or quality represented.
- I. The Landscape Architect shall have the right, during any phase of the work operations, to reject any and all work and materials which do not meet the requirements of the plans and specifications. Rejected work and materials shall be immediately removed from the project area and replaced with acceptable work and material within ten (10) calendar days or as approved in writing by the Landscape Architect.
- J. The fact that the project Landscape Architect has not made an early construction observation and discovery of faulty work or work omitted, or of work performed which is not in accordance with the contract requirements, shall not bar the Landscape Architect from subsequently rejecting such substandard work.

## 1.2 MATERIAL DELIVERY AND HANDLING

- A. Movement of material shall comply with all Federal, State, and local laws, regulations and ordinances.
- B. Transport materials on vehicles large enough so that materials will not be crowded and damaged.
- C. The Contractor shall exercise care in handling, loading, unloading, storing and transporting all material to prevent damage. The Contractor shall assume full responsibility for protection and safekeeping of materials stored.

## 1.3 SUBMITTALS

- A. Provide two copies of catalog cut sheets of equipment specified or required. Submit two copies of shop drawings on the following:
  1. Pipe, Fittings, and Wire Conduit
  2. Sprinklers Heads and Quick Coupler Valves
  3. Gate Valves
  4. Valve Boxes
  5. Controller, Decoders, and Weather Sensor
  6. Two Wire Cable
  7. Automatic Valves
  8. Backflow Prevention
  9. Pump Station
  10. Underground Storage Tank

- B. Installation Instructions: Submit two copies of installation instructions, including mounting details for each automatic controller.
- C. Warranties: Provide manufacturer's warranties as applicable.
- D. Operating Instructions: Submit written operating instructions with a schedule indicating length of time each valve is to operate to apply a specified amount of water.
- E. Written request for approval to substitute a material's type, grade, quality, size, quantity, etc. due to the non-availability of the material specified. Request shall be submitted within fourteen (14) calendar days after the preconstruction conference. Approval shall be given by the Landscape Architect before the material is delivered and installed on the project.
- F. Certificate of Qualification: Submit certificate of installer's experience at least 4 weeks prior to starting work, identifying ten (10) other projects of comparable complexity. Provide Owner/Client/General Contractor/Architect of record names, postal address, phone, fax, email address and photographs of such projects.
- G. Submit prints of Shop drawings for any special conditions not covered in the details indicated. This shall be for review by the Landscape Architect before they are installed on the project.
- H. Maintenance Instructions: Submit maintenance instructions on all items requiring manufacturer's standard detail submittal.
- I. Extra Stock: Provide owner with two sprinkler heads of each size and type and two keys for valve markers.

#### 1.4 SUBSTITUTIONS

- A. Substitution of material will only be permitted upon submission of documented proof that the particular material specified is not obtainable. Substitutions shall be approved in writing by the Landscape Architect before the installation of any substitutes.

#### 1.5 SIZE, QUALITY AND GRADE OF REPLACEMENT

- A. Replacement material shall be of the same quality and grade as that of the material to be replaced.
- B. Replacements shall be guaranteed for a period equal to the originally specified guarantee. This guarantee period shall begin at time of acceptance of the replacement.
- C. Final payment to the Contractor shall not relieve him of the guarantee obligations.

#### 1.6 PLAN AND SPECIFICATION INTERPRETATION

- A. On the plans, figured dimensions shall govern over scaled dimensions. If any error or discrepancy is found in the plans and specifications, the Contractor shall bring the error or discrepancy to the attention of the Landscape Architect for an interpretation and decision. In resolving conflicts between the plans and specifications, the plans shall

govern over the specifications. The Landscape Architect shall have the right to correct apparent errors or omissions in the plans and specifications and to make such interpretations, as he may deem necessary for the proper fulfillment of the intent of the Plans and Specifications.

- B. The irrigation system indicated on the plans is drawn for clarity and is essentially diagrammatic. Sprinkler head spacing shown on the plans shall not be modified unless accepted in writing by the Landscape Architect.

#### 1.7 REVIEW OF SHOP DRAWINGS

- A. The purpose of the shop drawing review by the Landscape Architect is to check for conformance with the design concept, not for accuracy or completeness of details or quantities and procedures.
- B. Corrections or comments made on the shop drawings during the review do not relieve the Contractor from compliance with the requirements of the plans and specifications.
- C. Acceptance of a specific item shall not include acceptance of an assembly of which the item is a component.
- D. Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the Work of all trades; and to performing all work in a safe and satisfactory manner.

#### 1.8 AS-BUILT DRAWINGS

- A. Prints of the plans prepared by the Landscape Architect will be supplied to the Contractor for recording "As-Built" information. In addition, the Contractor shall have a set of prints of the shop drawings prepared by the Contractor, sub-contractors, etc. for recording "As-Built" information. These prints shall be kept at the job site at all times.
- B. Immediately upon installation of any work that deviates from what is shown on the prints, the Contractor shall clearly indicate such changes in red pencil on the prints. Such changes shall include, but not be limited to, changes in (1) material, (2) sizes of material, (3) location, and (4) quantities. Dimensions shall be used where required, such as, but not limited to, underground utilities.
- C. Upon completion of the work, the completed set of "As-Built" prints shall be delivered to the Owner for review and confirmed acceptance.

#### 1.9 PERMITS AND CODES

- A. The Contractor shall procure all necessary permits to accomplish all of the work.
- B. The Contractor is responsible for performing all work in accordance with all applicable regulations, ordinances and code requirements from the appropriate jurisdiction in which the project is located.

#### 1.10 CHANGES AND ADDITIONAL WORK

- A. The Contractor shall not start any changes or additional work on the project until the Owner and the Contractor have executed a written agreement setting forth the adjusted contract amount. Any work performed on any changes or additional work prior to the execution of a written agreement, may or may not be compensated for by the Owner.

#### 1.11 "JOB SITE" / "PROJECT SITE" ETC.

- A. The words "job site", "project site", "project", "site" shall be synonymous with one another when used in these documents.

#### 1.12 SAFETY

- A. In performing the scope of work, all safety on or off the job site shall be the sole responsibility of the Contractor. The Owner and Architect will NOT be held responsible for safety on or off the job site. The Landscape Architect's "on site" observation will be only for the purpose of verifying that the Plans and Specifications are being implemented properly. The Landscape Architect's "on site" observations are NOT for safety on or off the project site.

#### 1.13 CONSTRUCTION OBSERVATION

- A. The Landscape Architects "on site" observations shall be only for the purpose of verifying that the plans and specifications are being implemented properly. These observations are NOT intended to be take charge, direct, run or manage the implementation of the plans and specifications nor are they to be construed to take charge, direct, run or manage the Contractor while he is performing the scope of work indicated in these specifications.

#### 1.14 PAYMENT FOR ADDITIONAL SERVICES

- A. The Contractor shall pay for any services or additional services performed by the Landscape Architect which resulted from actions by the Contractor, such as, but not limited to, improper performance, lack of performance or noncompliance with the plans and specifications. Such services or additional services shall include, but are not limited to:
  - 1. Repeated construction observation related to the completion of any "punch lists".
  - 2. Repeated construction observation related to defective or unauthorized work.
  - 3. Construction observation related to tests which repeatedly fail.
  - 4. Construction observation of materials or work which are found to NOT be within an acceptable, normal and reasonable deviation or variation from the plans and specifications.

### PART 2 - PRODUCTS

#### 2.1 PVC PIPE

- A. PVC pipe shall be virgin, high impact, polyvinyl chloride pipe which shall be continuously and permanently marked with the manufacturer's name, material, size, and schedule or type. Pipe shall conform to US Department of Commerce Commercial Standard CS 207-60 or latest revision. Material shall conform to all requirements of Commercial Standard (CS 256-63) or latest revision.
- B. Main line, sleeves, and laterals and wire conduit shall be SCH 40 PVC conforming to ASTM D 1785.

## 2.2 FITTINGS

- A. Lateral pipe fittings shall be SCH 40, Type 1 PVC, and must be of domestic manufacturer. Fittings shall be identified according to pressure rating or schedule.
- B. Galvanized fittings shall be malleable iron screwed type conforming to ANSI B. 16.3.
- C. Main line fittings shall be ductile iron push-on type, and must be of domestic manufacturer. Fittings shall be identified according to pressure rating or schedule.

## 2.3 SWING JOINTS / RISERS

- A. Pop-up spray and small turf rotor heads located in sod, mulch, and ground covers shall be installed on flexible swing joints consisting of thickwalled poly pipe and appropriate insert elbows. Large turf rotor heads shall be installed on pre-fabricated PVC swing joints.
- B. Shrub type spray heads and bubblers shall be installed on PVC swing joints consisting of SCH 80 nipples and SCH 40 fittings and riser pipe.

## 2.4 SPRINKLERS

- A. All sprinklers shall be as called for on the irrigation plan and shall be manufactured by RainBird, or approved equivalent. Each sprinkler shall perform to the manufacturer's specifications concerning diameter of throw and water volume at given pressure. Spacing of heads shall not exceed the manufacturer's maximum recommendations.
- B. Shrub type spray heads and bubblers: RainBird 1800 series with multiple interchangeable nozzles and radius adjustment screw.
- C. Pop Up Spray Sprinklers: RainBird 1800 Series 6" and 12" type constructed of cycloc with fixed pattern, screw-type flow adjustment, stainless steel retraction spring, and multiple interchangeable nozzles.
- D. Pop-Up Rotary Sprinklers: Rainbird 5000 and Falcon series with multiple interchangeable nozzles and radius and arc adjustment features.

## 2.5 AUTOMATIC VALVES

- A. Rain Bird PGA series or approved equivalent electrically activated remotely operated globe/angle valve, normally closed, with cycloc body, integrally molded single seat,

diaphragm operated, 24 volt electric-solenoid actuated, and with manually operated adjusting stem enabling valve to be partially or fully closed.

## 2.6 AUTOMATIC CONTROL SYSTEM

- A. Control system shall be a Rain Bird ESP series 2 wire decoder type.
- B. Controller shall be Rain Bird ESP-LXD with a capacity of 100 stations.
- C. Decoders shall be Rain Bird #FD-101 Turf single station type.
- D. Landscape irrigation and maintenance remote shall be Rain Bird #LIMR.
- E. Decoder programming unit Rain Bird #DFU-210.
- F. Ground rods, clamps, and plates.

## 2.7 CONTROL WIRES

- A. Control wires shall be Rain Bird Maxi cable, #14-2UF.

## 2.8 GATE VALVES

- A. Type 1, Class 150 lb., threaded ends, FS WW-V54, Nibco Model T-111 all bronze body, or approved equivalent.

## 2.9 VALVE BOX

- A. Ametek standard box #10-170-001 with standard cover #10-173-134, or approved equivalent.

## 2.10 RAIN SENSOR

- A. Rain sensor shall be a RainBird RSD-BEx series, or approved equivalent.

## 2.11 BACKFLOW PREVENTION

- A. Backflow prevention shall be installed to meet code requirements for cross connection control.
- B. Prevention shall be manufactured by Febco (or approved equivalent.).

## 2.12 QUICK COUPLER VALVES AND KEYS

- A. Quick coupler valves shall be Rain Bird #5.
- B. Quick coupler keys shall be Rain Bird #55K.

## 2.13 PUMP STATION

- A. Pump station shall be a pre-fabricated type with a capacity of 225 gpm at 184 FT.HD.

- B. Station shall be manufactured by Hoover Pump, model # HC2F-20PDV-230/3-E-125, F, M, R2, T, Z, or approved equal.

#### 2.15 STORAGE TANK

- A. Storage tank shall be single walled ABOVEGROUND OF HIGH DENSITY POLYETHYLENE WITH u.v. STABILIZERS BY Ace Roto Mold with a capacity of 5,000 gallons.
- B. Tank shall be VT5000-102 with a 1.7 specific gravity manufactured by Den Hartog Industries or approved equal.
- C. Tankd shall be black.

#### 2.16 AIR RELIEF VALVES

- A. Air relief valves shall be manufactured by Bermad or approved equal.

### PART 3 - EXECUTION

#### 3.1 PROJECT SITE

- A. Utilities
  1. The work area may have existing utilities, such as, but not limited to, telephone, electric, sewer, cable TV, gas and drainage. The location of some of these existing utilities may or may not have been located on the plans. However, no guarantee is implied that the plans are accurate or complete. It shall be the responsibility of the Contractor to verify the location of all such utilities, structures, etc., by hand excavation or other appropriate measures before performing any work. CALL SUNSHINE. The Contractor is responsible for the damage caused by his work to any utilities, structures or other facilities.
  2. The Contractor shall take immediate steps to repair, replace, or restore all services to any utilities or other facilities which are disrupted due to his operations. All costs involved in the repairs and restoring disrupted service resulting from negligence on the part of the Contractor shall be borne by the Contractor and he shall be fully responsible for any and all claims resulting from the damage.
  3. Should utilities, structures, etc., be encountered which interfere with the work, the Landscape Architect shall be consulted immediately in order for a decision to be made on the relocation of the work so it will clear the obstruction, if the obstruction cannot be relocated.
  4. The Contractor shall not purposefully disrupt or disconnect any type of utility whatsoever without first obtaining the written permission of the Owner. Requests for disconnection must be in writing and received by the Owner at least 72 hours prior to the time of the requested interruption.

### 3.2 GRADES

- A. It shall be the responsibility of the Contractor to provide the backfilling, consolidation of fill and grading of his trenches so that the final level conforms to surrounding grades. Existing or proposed drainage patterns shall NOT be modified by this contract.

### 3.3 PREPARATION AND LAYOUT

- A. Modifications due to Field Conditions: If conditions occur on the project that might cause changes to the system, those proposed changes shall be presented as shop drawings by the Contractor. Review and written acceptance by the Landscape Architect must occur prior to any modification in the field.
- B. Layout of Main and Laterals: The sprinkler main lines and all laterals shall be laid out by the Contractor and observed, if necessary, by the Landscape Architect prior to excavation. Any adjustment or modification that requires approval by the Landscape Architect for general conformance with construction document requirements shall be done prior to the excavation operation.
- C. Layout of Sprinkler Heads: All sprinkler head locations shall be staked by the Contractor and observed, if necessary, by the Landscape Architect prior to installation for compliance with uniformity and correctness of both pattern and coverage. If there are discrepancies in the site and the drawings they shall be brought to the attention of the Landscape Architect by the Contractor so that corrective actions can be taken prior to any installation.
- D. Valve Locations: The location of all valves shall be in landscape areas. The location of all valves shall be staked by the Contractor and accepted, if necessary, by the Landscape Architect prior to installation to insure ease of access for maintenance and to insure that they do not conflict with other elements on the project. Each valve shall be installed in a separate valve box.
- E. Irrigation Plans: The irrigation system indicated on the plans is shown for clarity and is essentially diagrammatic. Spacing of the heads shown on the plans shall not be modified unless accepted in writing by the Landscape Architect.

### 3.4 INSTALLATION

- A. General: The sprinkler system shall be installed after the completion of site grading. System shall be installed to match site conditions.

### 3.5 EXCAVATING AND TRENCHING

- A. See Section 312300, Trench Excavation and Fill.
  - 1. Excavate trench to pipe grade depth.
  - 2. Make width of trench at least six (6) inches or one and a half times the diameter of pipe, whichever is wider.
  - 3. Backfill and hand tamp excavation prior to installing piping.

4. In soils containing rock or other hard material that might damage pipe, excavate trenches six (6) inches deeper than required; then backfill to pipe grade with selected fine earth or sand.
5. Keep trenches free of obstructions and debris that can damage pipe.
6. Do not mix subsoil with topsoil.
7. Protect root system of existing trees from damage. In cases of conflicts between irrigation plans and site conditions, contact the Landscape Architect.

### 3.6 PIPING SYSTEM

#### A. COVER:

1. Pipe shall be installed at sufficient depth below ground to protect it from hazard such as vehicular traffic or routine occurrences which occur in the normal use and maintenance of the property. Depths of cover shall meet or exceed scs code 430-DD. Refer to applicable detail for additional information. Refer to applicable installation details.

#### B. CLEARANCE:

1. Install piping to maintain minimum clearances between lines:
  - a. 4" - for 2" pipe and smaller
  - b. 12" - for 2 1/2" pipe and larger
  - c. 12" - other services
2. Maintain a minimum vertical clearance of 1" between lines that cross at greater than 45 degrees.
3. Sleeve pipe routed under pavement. Each sleeve shall be: (1) buried to a minimum depth of 18"; (2) two pipe sizes larger than the carrier pipe; and (3) extended beyond hardscaped area 24" on both sides. Contractor shall verify the size, depth location of all existing sleeves.

#### C. INSTALLATION:

1. Galvanized steel pipe shall be thoroughly threaded in accordance with ANSI B2.1. Joint compound shall be applied to male end only.
2. PVC pipe joints shall be connected in accordance with ASTM D-2855-73 and pipe manufacturer's instructions.
3. Thrust blocks shall be installed at main line fittings where the flow of water changes direction.

### 3.7 VALVES

- A. Each manual valve shall be installed in a valve box extending from grade to valve body with a minimum cover of 4" measured from finish grade to the top of the valve stem.
- B. Each automatic valve shall be installed plumb to within 1/16 inch in a valve box extending from grade to valve body with a minimum of 4" cover measured from grade to top of valve. Arrange for easy adjustment and removal. Provide gravel below valve to insure drainage

### 3.8 SPRINKLERS

- A. Pop-up type sprinklers located in sod, mulch, and ground covers shall be installed on swing joints as shown on the detail drawing. Each sprinkler shall be installed so the top is slightly above finished grade. Backfill around swing joints and sprinklers shall be free of rocks, roots or foreign debris. Pop-up spray heads shall be installed four (4) inches in from hardscape areas, shrub heads and 12" pop-up spray heads 12", and rotor heads 6".
- B. Pop-up sprinklers located in shrub masses shall be installed on ½" SCH 40 PVC risers to a height so each sprinkler is concealed from view except during use.
- C. Shrub type sprinklers and bubblers shall be installed on swing joint type PVC risers. Shrub heads shall be installed a standard height of 6" above plants and shall be located within shrub masses to be concealed from view. Bubblers shall be installed at the base of tall shrubs and palms for low level watering. Risers shall be painted flat black to be less visible. Each spray head shall be equipped with the appropriate MPR nozzle.
- D. Sprinklers shall be installed and maintained at the proper height to be hidden from view and to eliminate when possible the chance of injury to the public.

### 3.9 CONTROL WIRE

- A. Control wire shall be installed in SCH 40 PVC wire conduit throughout and in the main line trench. Pull boxes shall be provided so the maximum distance between access points does not exceed 250 feet. A 10" loop of wire shall be provided at each valve.
- B. Maxi cable shall be installed in accordance with RainBird instructions.

### 3.10 AUTOMATIC CONTROL SYSTEM

- A. Controller shall be installed in accordance with manufacturer's instructions. Proper grounding equipment shall be provided for lightning protection.
- B. Location of controller will be accepted as being in conformance with the construction documents by the Project Engineer and Landscape Architect prior to the installation.
- C. Controller shall be installed and positioned to allow for easy access and viewing.
- D. Decoders shall be installed in accordance with Rain Bird's instructions.
- E. Proper grounding shall be established as instructed by Rain Bird and Paige Electric. Ground rods, plates, and clamps shall be used.

### 3.11 BACKFLOW PREVENTION

- A. Backflow prevention shall be installed to meet code requirements for cross connection control.
- B. The preventer shall be located to be concealed from view.

## 3.12 WATER CONSERVATION EQUIPMENT

- A. Water conservation equipment shall be installed in accordance with manufacturer's instructions. The rain sensor shall be placed on a stationary structure, minimum of 5' clearance from other outdoor equipment, free and clear of any tree canopy or other overhead obstruction, and above the height of sprinkler coverage.

## 3.13 QUICK COUPLER VALVES

- A. Quick coupler valves shall be installed throughout the site for supplemental hand watering.
- B. Each quick coupler valve shall be installed on a pre-fabricated PVC swing joint and in a valve box.

## 3.14 PUMP STATION

- A. Location of pump station shall be approved on site.
- B. Station shall be installed in accordance with manufacturer's instructions.

## 3.15 STORAGE TANK

- A. Location of storage tank shall be approved on site by Architect.
- B. Tank shall be installed in accordance with manufacturer's instructions. Proper anchoring shall be established, per FBC.

## 3.16 AIR RELIEF VALVES

- A. Air relief valves shall be installed to protect the piping system from excessive pressures which develop when entrapped air is compressed.
- B. Each valve shall be installed in a valve box.

## 3.17 CLEANING, TESTING, AND BALANCING

- A. Before testing, thoroughly flush piping system until clean, to ensure that no rock, sand or other foreign material remains in the lines.
- B. Do not cover piping system with backfill until tests are satisfactorily performed.
- C. Leaks shall be repaired immediately and the system shall be retested until found satisfactory.
- D. Hydrostatically test the piping system at 100 psi for one hour with no loss in pressure.
  - 1. Test the piping system with plugs at swing joints and branch locations.
  - 2. Install swing joints after hydrostatic testing is satisfactorily performed.

- E. Notify Project Architect/Engineer/Landscape Architect five (5) business days in advance of any test and obtain acceptance of tests from Project Architect/Engineer/Landscape Architect before covering piping.
- F. Provide pattern, throw and delivery as shown on drawings.
- G. Adjust and balance the components of the system to provide complete (100%) coverage with a minimum overthrow.

### 3.18 CLEANUP

- A. Disposal of Trash: All debris and other objectionable material created by the irrigation installation shall be removed completely on a daily basis from the job site or, as recommended by the Landscape Architect.
- B. Excess Fill: All excess fill, which results from the installation of the irrigation system, shall remain the property of the Owner and remain on the project at the option of the Owner. No excess fill shall be removed or disposed of from the site until approved by the Owner. Excess fill shall be disposed of as directed by the Owner.

### 3.19 FINAL CONSTRUCTION OBSERVATION

- A. Coverage Test: When the entire system is completed, the Contractor, in the presence of the Owner, Project Architect, and Landscape Architect, shall perform a coverage test to determine if the water coverage for all areas is complete and adequate. The Contractor shall furnish all materials and perform all work required to correct inadequacies.
- B. The coverage test shall be conducted during a wind-less period. The Owner and Project Landscape Architect must be notified five (5) business days prior to the desired test date, in order to arrange a mutually agreeable time.
- C. Final Construction Observation: At the completion of the final planting observation, the Project Landscape Architect shall perform a final construction observation of the irrigation system. The Owner, or his representative, and the Contractor shall be present. If all construction provided for and contemplated by the contract is found to be completed in accordance with the contract plans and specifications, such construction observation shall constitute the final one. The Contractor shall be notified in writing of acceptance and date of acceptance.
- D. If, however, the final construction observation mentioned in paragraph C, above, discloses any work, in whole or in part, that has not been completed in accordance with the contract plans and specifications, final acceptance shall not be given to the Contractor. All deficiencies in the system shall be corrected promptly by the Contractor, including changing shrub heads to pop-up heads, or vice-versa, as required. The Contractor shall label the control stations as per irrigation plan.
- E. Upon correction of work, another construction observation will be made which shall constitute the final construction observation, provided the work has been completed as per contract documents. In such event, the Owner and Landscape Architect will make the final acceptance and notify the Contractor in writing, including the date of acceptance.

- F. Completion of the work shall mean the general compliance and conformity with the provisions expressed or implied in the plans and specifications including any and all "punch lists" which may be issued outlining certain items of work which were found unsatisfactory or require completion or corrective action.
- G. If, after the final construction observation, the Project Landscape Architect is of the opinion that the irrigation work has been performed in general conformance with construction document requirements as per the drawings, specifications, and all "punch lists" which may have been issued outlining certain items of work which were found unsatisfactory or required completion or corrective action, the Landscape Architect will give the Contractor written notice that the work is in general conformance with construction document requirements and the date of final acceptance.

### 3.20 GUARANTEE

- A. The Irrigation Contractor shall warrant the installation free from defect of workmanship and/or materials for a period of one (1) year after written notice that the work is in general conformance with construction document requirements. Upon notification of any defects, the Contractor shall promptly make good any such defects that developed within the warranty period without expense to the Owner.

END OF SECTION 32 84 00

## SECTION 329113 - SOIL PREPARATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.
- B. Related Requirements:
  - 1. Section 129300 "Site Furnishings" for placing planting soil in exterior unit planters.
  - 2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
  - 3. Section 329300 "Plants" for placing planting soil for plantings.

## 1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

- H. **Manufactured Soil:** Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
  - I. **NAPT:** North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
  - J. **Organic Matter:** The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
  - K. **Planting Soil:** Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
  - L. **RCRA Metals:** Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
  - M. **SSSA:** Soil Science Society of America.
  - N. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
  - O. **Subsoil:** Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
  - P. **Surface Soil:** Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
  - Q. **USCC:** U.S. Composting Council.
- 1.4 **ACTION SUBMITTALS**
- A. **Product Data:** For each type of product.
    - 1. Include recommendations for application and use.
    - 2. Include test data substantiating that products comply with requirements.
    - 3. Include sieve analyses for aggregate materials.
    - 4. **Material Certificates:** For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
      - a. Manufacturer's qualified testing agency's certified analysis of standard products.
      - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
      - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
  - B. **Samples:** For each bulk-supplied material, 1-gal. (4-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Field quality-control reports.

### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
  - 1. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.
  - 1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
  - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

### 1.8 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Architect and state-certified, -licensed, or -registered soil scientist under the direction of the testing agency.
  - 1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
  - 2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
  - 3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Architect for its records.
  - 4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

### 1.9 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.

## B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
  - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
  - b. Hydrometer Method: Report percentages of sand, silt, and clay.
2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

## C. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

## D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAFT SERA-6, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.

15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
  16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
  2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight [per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Do not move or handle materials when they are wet or frozen.
  4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

## PART 2 - PRODUCTS

### 2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Planting-Soil Type Soil Backfill: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil.
1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from agricultural

- land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants.
2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 5.5 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
  3. Unacceptable Properties: Clean soil of the following:
    - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 2 percent by dry weight of the imported soil.
    - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1/4 inches (6.4 mm) in any dimension.
  4. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
    - a. Ratio of Loose Compost to Soil: 1:3 by volume.
    - b. Ratio of Loose Sphagnum Peat to Soil: 1:3 by volume.
    - c. Weight of Iron Sulfate: 12 lbs per 1000 sq. ft. (100 sq. m) per 6 inches (150 mm) of soil depth.
    - d. Weight of Agricultural Gypsum: 45 lbs per 1000 sq. ft. (100 sq. m) per 6 inches (150 mm) of soil depth.
    - e. Weight of Commercial Fertilizer: 5 lbs per 1000 sq. ft. (100 sq. m) per 6 inches (150 mm) of soil depth.
    - f. Weight of Slow-Release Fertilizer: 5 lbs per 1000 sq. ft. (100 sq. m) per 6 inches (150 mm) of soil depth.
- C. Planting-Soil Type Soil Backfill: Manufactured soil consisting of manufacturer's basic sandy loam according to USDA textures blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
  2. Additional Properties of Manufacturer's Basic Soil before Amending: Soil reaction of pH 5.5 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
  3. Unacceptable Properties: Manufactured soil shall not contain the following:
    - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 2 percent by dry weight of the manufactured soil.
    - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1/4 inches (6.4 mm) in any dimension.

4. Blend manufacturer's basic soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
  - a. Ratio of Loose Compost to Soil: 1:3 by volume.
  - b. Ratio of Loose Sphagnum Peat to Soil: 1:3 by volume.
  - c. Volume of Sand: 1:3
  - d. Volume of Perlite: 120 lb per cu. yd. (cu. m).
  - e. Weight of Iron Sulfate: 30 lb per cu. yd. (cu. m).
  - f. Weight of Agricultural Gypsum: 120 lb per cu. yd. (cu. m).
  - g. Weight of Commercial Fertilizer: 5 lb per cu. yd. (cu. m).
  - h. Weight of Slow-Release Fertilizer: 5 lb per cu. yd. (cu. m)..

## 2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
- B. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- C. Perlite: Horticultural perlite, soil amendment grade.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.
- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

## 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/4-inch (6.4-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

## 2.4 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  1. Composition: Mix shall remedy deficiencies found in soil test

- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
  - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches (150 mm) and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 2 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 1/4-inch (6.4-mm) sieve to remove large materials.

#### 3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 12 inches (300 mm). Remove stones, construction debris and inorganic matter larger than 1/4-inch (6.4-mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth of 2 inches (50 mm), but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
    - a. Mix lime or sulfur with dry soil before mixing fertilizer.

- b. Mix fertilizer with planting soil no more than seven days before planting.
  - D. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
  - E. Mix soil backfill with existing soil to a depth of 6 inches in sodden grass areas.
- 3.4 FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - B. Perform the following tests and inspections:
    - 1. Percolation Test: 1 inch of water in ten (10) minutes.
    - 2. Soil Analysis: Physical testing; chemical testing; fertility and organic matter content.
  - C. Soil will be considered defective if it does not pass tests and inspections.
  - D. Prepare test and inspection reports.
  - E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.
- 3.5 PROTECTION
- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
  - B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
    - 1. Storage of construction materials, debris, or excavated material.
    - 2. Parking vehicles or equipment.
    - 3. Vehicle traffic.
    - 4. Foot traffic.
    - 5. Erection of sheds or structures.
    - 6. Impoundment of water.
    - 7. Excavation or other digging unless otherwise indicated.
  - C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.
- 3.6 CLEANING
- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
  - B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

**8/19/2015**

**Truman Waterfront Park**

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

## SECTION 329200 - TURF AND GRASSES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Sodding.
  - 2. Erosion-control material(s).
  - 3. Grass paving.
- B. Related Requirements:
  - 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
  - 2. Section 328400 "Irrigation System".

## 1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Specifications for Turfgrass Sod Materials" in TPI's (Turfgrass Producers International) "Guideline Specifications to Turfgrass Sodding."

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Product Certificates: For fertilizers, from manufacturer.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Pesticide Applicator: State licensed, commercial.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.

## 1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass (*Cynodon dactylon* 'Tifway 419), St. Augustine Grass (*Stenotaphrum Secundatum Captiva*), and Bahia Grass (*Paspalum Notatum*).

### 2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

### 2.3 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

### 2.4 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

- C. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch (75-mm) nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
    - a. Invisible Structures, Inc.; Slopetame 2.
    - b. Presto Products Company; Geoweb.
    - c. Tenax Corporation - USA; Tenweb.

## 2.5 GRASS-PAVING MATERIALS

- A. Grass Paving: Cellular, nonbiodegradable plastic mats, designed to contain small areas of soil and enhance the ability of turf to support vehicular and pedestrian traffic, of manufacturer's standard nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Airfield Systems, LLC; AirField Systems Grass Paving.
    - b. Grid Technologies, Inc.; Netlon 50.
    - c. Invisible Structures, Inc.; Grasspave2.
    - d. PermaTurf Co., Inc.;
    - e. Presto Products Company; Geoblock Porous Pavement System.
    - f. RK Manufacturing, Inc.; Grassy Pavers.
- B. Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- C. Sand: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
- D. Sandy Loam Soil Mix: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate blended with planting soil. Use blend consisting of 1/2 sand and 1/2 planting soil.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

### 3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
  - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Verify finish grade are final.
- D. Verify finish grade is 3" lower next to sidewalks, curbs and paved areas in location where grass/sod is specified.
  - 1. See details on Landscape drawings.

### 3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.
  - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

### 3.5 PREPARATION FOR GRASS-PAVING MATERIALS

- A. Reduce subgrade elevation soil to allow for thickness of grass-paving system. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade so that installed paving is within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions.
- B. Install base course and sand course as recommended by paving-material manufacturer for site conditions and according to details indicated on Drawings. Compact according to paving-material manufacturer's written instructions.
- C. Install paving mat and fasten according to paving-material manufacturer's written instructions.
- D. Before planting, fill cells of paving mat with planting soil and compact according to manufacturer's written instructions.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

### 3.6 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

### 3.7 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Keep turf uniformly moist to a depth of 4 inches (100 mm).
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow bermudagrass to a height of 1/2 to 1 inch (13 to 25 mm).
  2. Mow St. Augustinegrass to a height of 2 to 3 inches (50 to 75 mm).
- D. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that provides actual nitrogen of at least 1/2 lb/1000 sq. ft. (0.18 kg/92.9 sq. m) to turf area.

### 3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

### 3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

### 3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
  - 1. Sodded Turf: 30 days from date of planting completion or until final acceptance; whichever is longer.

END OF SECTION 329200

## SECTION 329300 - PLANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Soil and Groundwater Management Plan
  - 1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK."

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Plants.
  - 2. Tree stabilization.
  - 3. Tree-watering devices.
- B. Related Requirements:
  - 1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
  - 2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
  - 3. Section Transplanting: See Drawing Sheet LT-07.
  - 4. Section 328400 "Irrigation System"

## 1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
  - D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
  - E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
  - F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
  - G. Finish Grade: Elevation of finished surface of planting soil.
  - H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
  - I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
  - J. Planting Area: Areas to be planted.
  - K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
  - L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
  - M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
  - N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
  - O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- 1.4 COORDINATION
- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

#### 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod and person in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- B. Samples for Verification: For each of the following:

1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review by the Architect prior to commencement of installation. Maintain approved Samples on-site as a standard for comparison.
2. Organic Mulch: 1-gallon (4.5-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
  1. Manufacturer's certified analysis of standard products.
  2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

#### 1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

## 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of the American Nursery and Landscape Association.
  2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
  3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  4. Personnel Certifications: Installer's field supervisor shall have certification in all of the following categories from the Professional Landcare Network:
    - a. Landscape Industry Certified Technician - Exterior.
    - b. FNGLA Certified Horticultural Professional (FCHP).
    - c. FNGLA Certified Landscape Technician (FCLT)
    - d. FNGLA Certified Landscape Contractor (FCLC)
    - e. International Society of Arboriculture Member
    - f. American Society of Consulting Arborist Registered Consulting Arborist
  5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1 and Florida No. 1 per Grades and Standards for Nursery Stock, Florida Department of Agriculture and Consumer Services.
- C. Measurements: Measure according to ANSI Z60.1 and Florida No. 1 per Grades and Standards for Nursery Stock, Florida Department of Agriculture and Consumer Services. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
  2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Delivery of bare-root stock plants are not permitted.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
- G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
  - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
  - 2. Do not remove container-grown stock from containers before time of planting.
  - 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

## 1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be

obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

#### 1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
    - b. Structural failures including plantings falling or blowing over.
    - c. Faulty performance of tree stabilization.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Warranty Periods: From date of Final Completion and Acceptance.
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers: 12 months.
    - c. Annuals: Three months.
  3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace.
    - b. Replace plants that are more than 25 percent dead, in an unhealthy condition at end of warranty period or do not meet Florida No. 1 Standards.
    - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
    - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1 and Florida No. 1 per Grades and Standards for Nursery Stock, Florida Department of Agriculture and Consumer Services; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
  - C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
  - D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
  - E. If formal or matched arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
  - F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

## 2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
  1. Size: 5-gram tablets.
  2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

## 2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
  1. Type: Derived from Florida exotic and invasive species; free of weeds and seeds.
  2. Size Range: 2 inches (50.8 mm) maximum, 1/2 inch (13 mm) minimum.
  3. Color: Natural.

## 2.4 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

## 2.5 TREE-STABILIZATION MATERIALS

### A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-4-inch nominal (38-by-101.6-mm actual) and 4-by-4-inch nominal (89-by-89-mm actual) by length indicated, pointed at one end.
2. Stakes: Rough-Sawn, sound, new, softwood with specified wood pressure-preservative treatment 2-by-4-inch nominal (38-by-89-mm actual) normal by length as indicated.
3. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
5. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.
6. Cleat: Galvanized
7. Wood Screws: Stainless steel
8. Lodge Pole: 3' diameter pressure treated.

### B. Root-Ball Stabilization Materials:

1. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) Border Concepts, Inc; Tomahawk Tree Stabilizers.
    - 2) Foresight Products, LLC; Duckbill Rootball Fixing System.
    - 3) Platipus Earth Anchoring Systems; D-Man System

### C. Palm Bracing: Battens or blocks, struts, straps, and protective padding.

1. Battens or Blocks and Struts: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 4-by-4-inch nominal (89-by-89-mm actual) by lengths indicated.
2. Straps: Adjustable steel package banding.
3. Padding: Burlap.
4. Proprietary Palm-Bracing Devices: Proprietary systems to secure each new planting by trunk; sized according to manufacturer's written recommendations unless otherwise indicated.
  - a. Products: Subject to compliance with requirements, provide the following:
    - 1) Border Concepts, Inc; Tomahawk Tree Stabilizers.
    - 2) Foresight Products, LLC; Duckbill Rootball Fixing System.

## 3) Platipus Earth Anchoring Systems: D-Man System

## 2.6 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Burlap: Non-synthetic, biodegradable.
- C. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- D. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- E. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
  - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

### 3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place planting soil (soil backfill) and mix with existing soil.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate 30g/1000 square feet.

### 3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
  - 1. Excavate planting pits with sides sloping inward at a 68-degree angle. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  - 2. Excavate approximately two times as wide as ball diameter for balled and burlapped and container-grown stock.
  - 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
  - 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
  - 5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  - 6. Maintain supervision of excavations during working hours.
  - 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil when combined with soil backfill, note on the drawings and in Section 329113 Soil Preparation. Contaminated soil shall not be used or reused.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
  - 1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

### 3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
  - 1. Backfill: Planting soil as noted on the drawings.
  - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 3. Backfill around root ball in layers, and “water-in” to eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
    - a. Quantity: Three for each caliper inch of plant.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
  - 1. Backfill: Planting soil as noted on drawings.
  - 2. Carefully remove root ball from container without damaging root ball or plant.
  - 3. Backfill around root ball in layers, and “water-in” to eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
    - a. Quantity: Three for each caliper inch of plant.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

### 3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape or reduce crown/canopy size.
- B. Do not apply pruning paint to wounds.

### 3.7 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
  - 1. Upright Staking: As indicated on drawings.
  - 2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
  - 3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
  - 1. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- C. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.
  - 1. Site-Fabricated Palm-Bracing Method:
    - a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk.
    - b. Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail-attached blocks on battens. Do not drive nails, screws, or other securing devices into palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.

### 3.8 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover, shrubs, and vines in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes as indicated on drawings.

- D. Water-in soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

### 3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
  - 1. Trees in Turf Areas: Apply organic mulch ring of 3-inch (75-mm) average thickness, with 36-inch (900-mm) diameter around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.
  - 2. Organic Mulch in Grass Planting Beds: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 2 inches (50.8 mm) of trunks or stems.

### 3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

### 3.11 PESTICIDE APPLICATION

- A. When necessary, apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

## 3.12 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed pruning and repairs.
  - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
  - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition not meeting grade and standards before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  - 1. Provide new trees of same size as those being replaced.
  - 2. Species of Replacement Trees: Same species being replaced.

## 3.13 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

## 3.14 MAINTENANCE SERVICE

- A. Maintenance: Contractor is responsible for all landscape maintenance, including new plant material, relocated plants and existing plants until final acceptance.

END OF SECTION 329300

## SECTION 33 11 00 WATER UTILITY DISTRIBUTION PIPING

## PART 1 - GENERAL

## 1.01 WORK INCLUDED

- A. The work to be performed under this Section shall include the furnishing and installing of water mains and appurtenances as herein described and as shown on the Drawings. The Contractor shall perform all excavation, backfilling, and related work required for the construction of these mains, in accordance with the provisions set forth under the applicable items of this Specification and of the General Conditions of the Contract. Where not otherwise set forth, all work shall be in accordance with AWWA (ANSI) C600.

## 1.02 REFERENCES

Standards applicable in this Specification include:

- A. American Water Works Association (AWWA) and American National Standards Institute (ANSI).
1. AWWA C104 (ANSI A21.4) Cement-Mortar Lining for Ductile-Iron and Gray Iron Pipe and Fittings for Water.
  2. AWWA C110 Gray-Iron and Ductile-Iron Fittings, 3-inch through 48-inch for Water and Other Liquids.
  3. AWWA C111 (ANSI A21.11) Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
  4. AWWA C150 (ANSI A21.50) Thickness Design of Ductile-Iron Pipe.
  5. AWWA C151 (ANSI A21.51) Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids.
  6. AWWA C605 Installation of PVC Pressure Pipe & Fittings.
  7. AWWA C601 Standard for Disinfecting Water Mains.
  8. AWWA C900 Polyvinyl Chloride Pressure Pipe 4" through 12"
  9. AWWA C901 Polyethylene Pressure Pipe and Tubing for Water Service.
- B. American Association of State Highway and Transportation Official (AASHTO).
- C. AASHTO T-180-82 The Moisture-Density Relation of Soils Using a 10-lb. (4.54 kg) Rammer and an 18-inch (457 mm) Drop.

## 1.03 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 - PRODUCTS

## 2.01 PIPE

Ductile Iron Pipe: Ductile iron pipe shall conform to AWWA C151 (ANSI A21.51) and shall be thickness Class 52.

- A. Lining: Ductile iron pipe for water mains shall have an internal lining of cement mortar in accordance with AWWA C104/A21.4.
- B. Coating: Buried ductile iron pipe shall be bituminous coated per AWWA C151/A21.10 and wrapped in a 8 mil polyethylene encasement.
- C. Polyvinyl Chloride Pipe (PVC): PVC pipe shall meet requirements of AWWA C900 DR-18 for pipe 4" to 12" in diameter, and shall be furnished in cast-iron pipe equivalent outside diameters with rubber gasketed joints. Pressure class shall be 150 psi (DR-18).
- D. Polyethylene pressure pipe and tubing, ½" through 3" having standard PE code designations PE2406, PE3406 and PE3408, shall be in accordance with AWWA Standard C-901, have a standard dimension ratio (SDR) of 9 with a 200 psi working pressure and have cooper equivalent (CTS) outside diameters. Polyethylene pipe shall be used for all service connections.

## 2.02 FITTINGS

- A. Fittings shall be ductile iron mechanical joint type conforming to AWWA/ANSI C153/A21.53 with MEGALUGS, or approved equivalent restraint. All fittings shall have a working pressure of 350 psi in size 4" through 12", and shall be coated and lined as specified for ductile iron pipe. Ductile iron fittings on PVC pipe shall be wrapped in a 8 mil polyethylene encasement extending 1 foot from each end of the fitting.

## 2.03 JOINTS

- A. Pipe shall be furnished with integral bell joints with locked in rubber gaskets.
- B. Restrained joint pipe shall be used for changes in elevation or alignment as shown on the Drawings or as required in the field by the Engineer. Ductile iron pipe restrained joints shall be "TR-Flex" by U.S. Pipe, "Lok-Ring" by American or approved equal. PVC pipe restrained joints shall be Certainteed Certa-Lok, EBAA Iron Series 1500 Retainers, or approved equivalent restraint. All restrained joints shall have a working pressure of 350 psi.

## PART 3 - EXECUTION

The installation and testing of the water main shall be done in accordance with ANSI/AWWA C600 plus the additional requirements described herein or shown on the Plans.

## 3.01 PREPARATION

- A. The layout of some of the piping systems shown on the Drawings may be diagrammatic but shall be followed as closely as the work will permit.
- B. In shipping, delivery, and installing pipe and accessories, they shall be handled in such manner as to insure a sound, undamaged condition. Particular care shall be taken not to injure pipe coating and no other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied.

### 3.02 INSTALLATION

#### A. General

- 1. All pipe, fittings and valves shall be installed according to AWWA Specification C600 or C605. Prior to installation, all pipe and appurtenances shall be examined for damage and defects. Under no circumstances shall defective pipe be installed. All lumps, blisters and excess coating materials shall be removed from the bell and spigot ends of each pipe. While being placed in the trench, care shall be taken to prevent foreign material from entering the pipe. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade.
- 2. At times when pipe laying is not in progress, the open end of the pipe shall be closed by a watertight plug. When practical, the plug shall remain in place until the trench is pumped completely dry. When it is necessary to deflect the pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed that of Table 5 in AWWA Specification C600 or C605.

#### B. Ductile Iron Fittings

- 1. Ductile iron fittings for use with ductile iron or PVC pipe shall be bell fittings with machined grooves for use with rubber rings. Grooves shall be clean and free of all sand or other foreign material before the ring is inserted. The pipe shall be properly lubricated prior to pushing the joints together. On installation of all bolting materials the Contractor shall utilize a graphite base non-binding lubricant (non-corrosive).

#### C. Mechanical Joints

- 1. Mechanical Joints are to be made in accordance with manufacturer's recommendations and requirements of pipe joint specifications. Care shall be taken to tighten bolts evenly around circumference of pipe and in no case shall bolts be overstressed.

#### D. Flanged Joints

- 1. Before making up flanged joints in ductile iron pipe and fittings, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of

sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to insure that bolt stresses are evenly distributed.

E. Valve Settings

1. All valves placed on branch lines or bends shall be restrained via anchor couplings or anchor tees as specified hereinabove. Valves and valve boxes shall be set plumb at the locations indicated, and in accordance with the details shown on the Drawings. After being positioned, backfill shall be carefully placed and hand tamped. Before installation, care shall be taken to see that all foreign matter has been removed from the interior of the barrel. Stuffing boxes shall be tightened and the valves opened and closed to see that all parts are in working condition.

F. Connection to Existing Mains

1. Connection to existing water mains shall be made by the Contractor. The Contractor shall be responsible for making all necessary arrangements with the FKAA for these connections and shall bear any costs incurred at no additional cost to the FKAA. Prior to commencing the work of connecting to existing facilities, the Contractor shall uncover or expose the point of connection and insure himself that he has all materials, equipment and all other facilities required to complete the installation, and that such connections can be made in accordance with the details shown on the Drawings.
2. The Contractor shall take every precaution to insure that the alignment or gradient of the existing facilities are not disturbed, or otherwise damaged, as a result of his construction procedures. In the event the existing facilities are damaged or otherwise disturbed, the Contractor will be required to do such necessary repair, re-alignment, or replacement, so as to restore these facilities to a water tight, workable, acceptable condition.
3. No existing valves shall be operated by the Contractor. These valves shall only be operated by personnel of the FKAA. The Contractor shall advise the FKAA Engineering Department, 24 hours in advance of making these connections. This work shall be done under direct supervision of personnel of the FKAA. The valves and fittings to be employed in these connections, shall be thoroughly swabbed with a 300 ppm solution of chlorine and water. The connections shall be made as rapidly as possible, and any water in the excavation shall be kept below the level of pipe and fittings. The Contractor may have to make connections at off-peak hours. Shut-downs shall be kept to a maximum of 2 hours, unless previously approved by the FKAA, pending extenuating circumstances. Once valves are installed, they shall only be operated by FKAA personnel.

G. Customer Service Connections

1. Service connections shall be installed of the type and size and at the locations shown on the Drawings. All materials shall be as shown on the Drawings and as stated in these specifications. All taps to the distribution main may be made with the main under pressure, or dry tapped. Customer Service connections shall be direct tapped on mains 6" in diameter or greater and shall have corporation stop Ford F-1000 or approved equal. For connections to 4" diameter mains, use brass tapping saddle Rockwell Style 323 or approved equal and corporation stop Ford F-1000 or approved equal. For connections to

2" diameter mains, use Pack Joint Tee Ford T441-774 or approved equal and corporation stop Ford F-1100 or approved equal.

#### H. Miscellaneous

1. All excavated material shall be stockpiled in a manner that will not hinder the work or obstruct sidewalks, roadways, and driveways. All utility control structures shall be kept accessible. This shall be designed to mean those areas as designed by the Permitting Agency unless otherwise specified. Material stockpiles on private property must have written consent with a copy to FKAA.
2. Trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of the pipe and/or fittings. Bellholes shall be provided at each joint to permit proper assembly and pipe support. When an unstable subgrade condition is encountered that could provide inadequate pipe support, additional trench bottom shall be excavated, refilled with suitable foundation material, and compacted as required to provide firm support.
3. All pipe shall be installed in dry trenches. Where conditions are such that running or standing water occurs in the trench bottom or the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps until the pipe has been installed and the backfill has been placed over the top of pipe to a depth equal to 1 and ½ pipe diameters.

#### 3.03 CUTTING AND CAPPING RETIRED WATER MAINS

1. As shown on the Drawings, some of the existing water mains are to be retired. The Contractor shall be responsible for cutting and capping or plugging, leak free, the existing water mains at the locations shown on the Drawings. Thrust blocks shall be installed at the capped end if required, dependent upon the type of existing pipe and method of capping to ensure that there is no movement in the pipe remaining in service. The Contractor shall obtain the approval of the FKAA prior to cutting any existing water mains.

#### 3.04 CUSTOMER SERVICE LINES

##### A. Location of Meters

1. All meters and meter boxes shall be located in the right-of-way as shown on the Drawings. Where meter relocations are required, the Contractor shall also install new service piping between the relocated meter and the point of connection on the customer's property.
2. If the meters are in "back" easements or at the back of lots it may be better to install the new meter boxes and run the on-site customer service piping up to the point of connection prior to relocating any meter. The exact sequence of operations will be decided by the FKAA in the field.

**B. On-Site Customer Service Piping**

1. Portions of the work to be constructed under the terms and conditions of these Contract Documents are the installation and construction of on-site customer service piping. In all instances where existing water meters are located in easements along the rear property lines, or where the existing water meters are located outside of the rights-of-way, the Contractor shall install such piping as may be required to connect the new meter locations with the customer's existing house potable water system. The point of connection will generally be at the old meter location, but, may be at some other point closer to, or at, the customer's house. Each new on-site customer service line shall be installed with a valve near the point of connection to the existing house potable water system. On-site customer service lines will be buried a minimum of 6-inches below existing grade and will be thoroughly flushed before connecting to the existing house potable water system. The inspector will determine the exact point of connection in the field so as to minimize future maintenance problems of the customer and the FCAA. All such work within private property shall be performed by or under the direct supervision of a licensed master plumber. Service lines from the meter to the customer's existing potable water system shall be schedule 40 PVC and shall be in accordance with requirements of the Standard Plumbing Code applicable in Monroe County, Florida.

**C. Removal of Existing Meter Boxes and Service Lines**

1. After water service has been restored through the existing meters and new service lines, the old meter boxes and service lines shall be removed from the site. Meter boxes which are no longer in use shall be carefully removed and delivered to a storage area designated by the Florida Keys Aqueduct Authority. Old service pipes above ground, or not more than two inches underground, except in paved areas, shall be removed and disposed of as directed. Service lines more than three inches below ground and those lines under paved areas shall be capped, abandoned and left undisturbed. All old service pipe and fittings located within 3 feet of the new meter box shall be removed.

**D. Installation**

1. New service line pipes installed by the Contractor shall be of the same size and type as the service lines being replaced, except that no new service lines shall be less than 3/4-inch size, and any galvanized steel service lines shall be replaced with Schedule 80 PVC pipe, ASTM SPEC. D1785, PVC 1120. Connections to existing house potable water systems shall be at the most practicable and suitable locations for satisfactory water service as determined by the FCAA. The FCAA will only furnish the new meters. The Contractor shall install the meters and make all connections thereto. All meter installations that are not T-10 meters will require a new dual check valve as shown on detail drawing no. 12. T-10 meter installations will require a second meter stop on the customer's side of the meter instead of a dual check valve.

**E. Types of Service Connections:**

1. Type "D". Furnish and install 1" polyethylene tubing including all fittings, adaptors and/or specials to connect the proposed service pipe to the existing meter (or new meter provided by FCAA) at the location shown. Any adjustment of the

meter or meter box within a five (5) foot radius shall be considered incidental and will not be paid under a separate item.

2. Type "E". Furnish and install 1" polyethylene tubing including all fittings, adapters and/or specials to connect the proposed dual service pipes to the existing meter (or new meter provided by FKAA) at the location shown. Any adjustment of the meter or meter box within a five (5) foot radius shall be considered incidental and will not be paid under a separate item.
3. Type "F". Furnish and install new meter box, 1" polyethylene tubing including all fittings, adapters and/or specials to connect the proposed new service connections to the new on-site service connection at the new location shown. The new meter box should be located as close to property line as possible within the public right-of-way. New on-site customer piping required to connect the new meter installation to the customer's potable water shall be considered a part of this item.
4. Type "G". Furnish and install two single meter boxes, 1" polyethylene tubing from the proposed main to the new meter boxes located within the right-of-way, meter valve or valves, meter idler or idlers, check valve or valves, all in accordance with the details shown on the drawings. New on-site customer piping required to connect the new meter installation to the customer's potable water shall be considered a part of this item.
5. Type "H". Relocate one (1) meter box, furnish and install 1" polyethylene tubing including all fittings, adapters and/or specials to connect the proposed dual service pipe to one (1) existing and one (1) relocated meter at the location shown. The relocated meter box shall be located as close to the property line as possible, within the public right-of-way and adjacent to the existing meter box. The new on-site customer piping required to connect the relocated meter installation to the customer's potable water system shall be considered a part of this item. Any adjustment of the existing meter box within a five foot (5') radius shall be considered incidental and shall not be paid under a separate item.

### 3.05 FIELD QUALITY CONTROL

#### A. Hydrostatic Tests

1. The Contractor shall provide all necessary material and shall perform all work required in connection with the test, including temporary plugs where required. All pipe on low pressure side of pressure reducing valves on distribution systems shall be tested to a hydrostatic pressure of 150 P.S.I. The required pressure as measured at the point of highest elevation shall be applied for not less than two hours, and all pipe, fittings, valves, and joints shall be made water tight if leakage is evident.
2. No pipe installation will be accepted unless and until the leakage is less than that as specified under Section 4.2 of the AWWA (ANSI) C600.

#### B. Pigging

1. All water main installations shall be cleaned with a polypropylene pigging device to clean all dirt, sand, and debris from the newly installed water main where determined by

the FKAA field representative. The FKAA field representative shall determine the extent and type of pigging required. At a minimum, a “bare” type, B3 style pig shall be used as manufactured by Pipeline Pigging Products Inc., or approved equal.

C. Sterilization of Complete Line

1. Before being placed in service, each line shall be sterilized in accordance with the directions of the Florida State Board of Health and in accordance with AWWA C601.

D. Connections to the Existing System

1. Connections to be made by the Contractor are shown on the Drawings. Connections shall not be made until the new main is cleared by DEP.

3.06 ADJUSTING AND CLEANING

A. Restoring Surfaces

1. The top surfaces of the backfill shall be restored to present standards or better conditions. Trenches shall be carefully examined upon the completion of backfilling and surface irregularities, which are dangerous or obstructive to traffic, are to be removed.
2. Paved sections shall conform in grade with adjacent areas and shall be of at least equal quality. Design mixes for flexible pavement shall be subject to approval by the City of Key West. All damaged or undermined areas of existing pavement, not previously removed, shall be removed and restored to original conditions or in the specified manner.
3. Equipment shall not travel over loose rock fragments, or other hard material, lying on sections or pavements which are not to be removed. Removal, replacement and restoration of areas of pavement shall be as indicated on drawings.

END OF SECTION

SECTION 33 12 00 WATER UTILITY DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Gate valves
- B. Ball Valve Curb Stops
- C. Residential Meter Dual Check Valves
- D. Ball Valve Meter Stops
- E. Saddles
- F. Pack Joint Tees
- G. Corporation Stops
- H. Pump Suction Control Valves
- I. Fire Hydrants
- J. Tapping Sleeves and Valves
- K. Valve Boxes Polyethylene Tubing
- L. Valve Identification Systems
- M. Pressure Reducing Valves
- N. Detectable Warning Tape

1.02 RELATED WORK

- A. Section 33 11 00: Water Utility Distribution Piping

1.03 REFERENCES

- A. AWWA - American Waterworks Association.
- B. ASTM - American Society for Testing Materials
- C. FS - Federal Specification.

## 1.04 SHOP DRAWINGS

- A. Submit detailed Shop Drawings in accordance with Section 014000 – Quality Requirements. Clearly indicate make, model, location, type, size, and pressure rating.

## 1.05 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 - PRODUCTS

## 2.01 VALVES - GENERAL

- A. All valves shall be furnished with affidavits from the manufacturers that the valves furnished under this Contract comply with all the applicable provisions of the respective AWWA Specifications, cited below. All valves shall be factory tested in accordance with AWWA Standard Leakage and Hydrostatic Tests and a certified test report shall be furnished stating that the valves have met the requirements of the test.
- B. Valves shall be furnished with mechanical joint or flanged ends. Valve ends with mechanical joints or flanged joints shall conform to AWWA Standard C110, “Gray-Iron and Ductile Iron Fittings, 3” through 48” for Water and other Liquids”. In addition, mechanical joints shall conform to ANSI/AWWA Standard C111/A21.11. Bolt holes in the flanges of the mechanical joint shall straddle the vertical and horizontal centerline. Flanges shall be ANSI Standard Class 125, plain faced and drilled.
- C. All valves three inches through 16 inch in diameter, shall be resilient seated or resilient wedge gate valves and all valves 18 inch in diameter and larger, shall be as specified and shown on the Drawings. All valves shall be polyethylene encased, from one foot on each side of the valve.

## 2.02 GATE VALVES

- A. Gate valves shall be resilient seated or resilient wedge gate valves for 150 psi working pressure, on low pressure side of pressure reducing valves conforming to AWWA Standard C-509 and C-500. The gate valves shall have a high strength bronze non-rising stem. Valves shall have neoprene or equal, but not natural rubber, EPDM O-ring stem seals (compatible with chloramines) and be of a design that permits the replacement of the O-ring seals while the valve is in service under pressure. The valves shall open by turning the operating nut counterclockwise. Operating nuts shall be

AWWA two inch square nuts with skirts.

- B. Valve body, bonnet, and gate shall be Ductile Iron conforming to ASTM A-536. Shell thickness of body and bonnet components shall conform to Table 2 Section 4.4 AWWA C-509 and C-500. So-called "thinwall" valves, not included in this Standard, are not allowed. Valve body and bonnet shall be coated on all exterior and interior surfaces with a fusion bonded epoxy conforming to the requirements of AWWA Standard for Protective Epoxy Interior Coatings for Valves and Hydrants; C-550. Manufacturer shall certify that the coating will conform to following sections of the Standard:
  - 1. Section 2 - Materials (relating to the suitability of the coating for use in a potable water system).
  - 2. Section 4 - Testing and Inspection (relating to qualification and production testing).
- C. Gate shall be covered with rubber over all interior and exterior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The stem hole through the gate shall be full opening top to bottom and shall also be covered with rubber.
- D. Body and bonnet shall be coated inside and out with a fusion bonded epoxy that meets or exceeds requirements of AWWA C550.
- E. Direct buried gate valves shall be polyethylene encased and shall have Type 304 stainless steel bonnet bolts.
- F. Gate valves shall be as manufactured by American Flow Control Series 2500, U.S. Pipe Metroseal 250, or an approved equal.

#### 2.03 BALL VALVE CURB STOPS

- A. Curb stops shall be Ford Series B-11, Mueller H10283 or approved equal. Ball valves shall have locking lugs and 2" square operating nut which opens to the left on 1½ " and 2" valves.

#### 2.04 RESIDENTIAL METER DUAL CHECK VALVES

- A. Meter check valves shall be dual check valve assemblies suitable for installation on 5/8-inch, 3/4-inch, 1-inch, and 1-1/2-inch lines, and shall be Ford HHS31, Mueller H-14242, or an approved equal.

#### 2.05 BALL VALVE METER STOPS

- A. Meter stops shall be Ford Series B43 or BF13, or an approved equal. Valves shall have lockable padlock wings, and open to the left.

#### 2.06 SADDLES

- A. Saddles shall be Rockwell International, Type 323, style double strap bronze saddles, for PVC and ductile iron pipe, or approved equal. Tapping saddles shall be used for all taps on 4" PVC pipe.

## 2.07 PACK JOINT TEES

- A. Pack joint tees shall be used to connect services to 2" water mains. They shall be Ford T441-774 or approved equal.

## 2.08 CORPORATION STOPS

- A. Corporation stops shall be Ford F-1000, FB-1000, or approved equal. The largest corporation stop which can be tapped directly into the pipe is 1-inch.

## 2.09 PUMP SUCTION CONTROL VALVES

Pump suction control valves shall be Cla-Val Model 50B-5KG.

## 2.10 FIRE HYDRANTS

- A. Fire hydrants shall be 6-inch, mechanical joint pipe connection with a minimum 5.25 inch valve opening. Hydrants shall be of AWWA approved type, designed for a 150 psi working pressure. Provisions shall be made for two 2.5 inch hose nozzles and one 4.5 inch pumper nozzle, open left (counter clockwise). All base threads shall conform to the national standard hose coupling thread specifications. Fire hydrants shall have a safety stem coupling to prevent bending of the operating stem, and a safety flange to prevent breaking of the hydrant barrel if hit by a vehicle. The hydrant base (shoe) shall be coated with a two-part thermo-setting epoxy, not less than 4 mils thick. Weather cap shall be metal. The maximum pressure loss allowable for the 5-1/4" valve opening shall be 2.2 psi at 1000 gpm flow based on 5 foot bury with 6" diameter inlet. The hydrant shall be a Mueller Super Centurion or American Darling B-84-B. The drain hole in the foot of the fire hydrant shall be plugged and all buried bolts shall be AISI Type 304 stainless steel.
- B. Fire hydrants shall be painted with one coat of rust proof primer and two finish coats of an approved red.

## 2.11 TAPPING SLEEVES AND VALVES

- A. Tapping Sleeves shall be ASTM 285 Grade C Steel or ASTM A-36 Carbon Steel with Fusion applied epoxy coating (AWWA C213-70). Tapping Sleeves shall utilize AISI Type 304 (ASTM A320 Grade B8) stainless steel bolts and nuts. Tapping Sleeves shall be as manufactured by JCM Industries Model 412, Romac Industries Model FTS420, or approved equal.
- B. Tapping valves shall be as specified for gate valves, hereinabove, and as further specified herein. Valve body, bonnet, and gate shall be Ductile Iron conforming to ASTM A-536. Tapping valves for use in tapping distribution mains shall be resilient seat gate valves. Inlet shall be Class 125, ANSI B16.1, ductile iron flange with centering ring to match tapping sleeve. Outlet shall be a mechanical joint. Tapping valves shall be compatible for use with a drilling machine. Tapping valves shall be attached to tapping sleeves with stainless steel nuts and bolts which shall be heavy hex-head AISI Type 316 (ASTM A320 Grade B8) stainless steel. Approved tapping valves include American Flow Control Series 2500, or approved equal.

## 2.12 VALVE BOXES

- A. Furnish, assemble, and place a valve box over the operating nut for each buried valve. The valve box shall be installed so as to prevent the transmission of surface loads directly to the valve or piping. Valve boxes shall be U.S. Foundry No. 7615, No. 7630 or approved equal.
- B. Valve extension stems shall be provided for all buried valves when operating nut is deeper than 3 feet below final grade.

## 2.13 POLYETHYLENE TUBING

- A. Service lines shall be polyethylene tubing conforming to ASTM D2737 and AWWA standard C-901; SDR 9 with a minimum working pressure of 200 psi.

## 2.14 VALVE IDENTIFICATION SYSTEMS

## A. Buried Valves:

1. In paved areas, tops of valve box covers shall be set flush with pavement. Following paving operations, a 30-inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a 30-inch square by 6-inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the drawings. Concrete for the pad shall be 3,000 psi compressive strength.
2. In unpaved areas, tops of valve box covers shall be set 0.20 foot above finished grade. After the top of the box is set to the proper elevation, a 30-inch square by 6-inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3,000 psi compressive strength.
3. Shall have valve boxes protected by a concrete pad. The concrete pad for the valve box cover shall have a 2 ½ -inch diameter, bronze disc embedded in the surface as shown on the drawings. The bronze disc shall have the following information neatly stamped on it:
  - a. Size of valve, inches
  - b. Type of valve:
    - i. GV - Gate Valve
    - ii. BFV - Butterfly Valve
    - iii. Ball Valve
  - c. Number of turns to fully open
  - d. Direction to open
  - e. Year of installation

## 2.15 PRESSURE REDUCING VALVES

- A. The pressure reducing valve shall be hydraulically operated, diaphragm actuated in globe pattern.

The valve shall maintain a constant downstream pressure regardless of inlet pressure variations. It shall contain a resilient synthetic rubber disc having a rectangular cross section, contained on three and one-half sides by a disc retainer.

- B. The seat ring shall be firmly held in place and not pressed into the body. The diaphragm assembly shall be fully guided to assure positive contact with the seat. The diaphragm assembly shall be the only moving part.
- C. The diaphragm shall consist of a nylon fabric reinforced BUNA-N rubber and shall not be used as a seating surface. All necessary repairs shall be possible without removing the valve from the line.
- D. All main valve interior components shall be manufactured from non-corrosive materials.
- E. The pilot valve shall be adjustable, direct acting, spring loaded and normally open. The reducing pilot shall be supplied with a stainless steel seat ring.
- F. The valve shall be CLA-VAL 90-01D, and shall be Pressure Class 300. The valve shall have 304L stainless steel body, stainless steel trim, and Class 250 flanged ends. The valve shall be piloted in reverse flow for fail-safe operation.

#### 2.16 DETECTABLE WARNING TAPE

- A. Detectable warning tapes shall be provided for all water mains. Such tape shall be magnetic type, 5 mils thick, 2mil thick aluminum center core, encased in mylar. Tape shall be blue imprinted with the words "Caution: Potable Water Line Below". Printing shall appear on both sides of the tape. The tape shall be placed between 6 and 12 inches below finish grade.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF VALVES

- A. Valves of the size and type shown on the Drawings shall be set plumb and installed at the locations indicated on the Drawings. Valves shall be installed in accordance with manufacturer's installation instructions and with the details shown on the Drawings.
- B. Valves shall be installed such that they are supported properly in their respective positions, free from distortion and strain. Valves shall be installed such that their weight is not borne by pumps and equipment that are not designed to support the weight of the valve.
- C. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Check and adjust all valves for smooth operation.
- D. Install valves with the operating stem in either horizontal or vertical position as shown on the drawings.

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- E. Allow sufficient clearance around the valve operator for proper operation.
- F. Clean iron flanges before installing flanged valves. Clean carbon steel flange bolts and nuts by wire brushing, lubricate threads with oil or graphite, and tighten nuts uniformly and progressively.
- G. For buried valves, a valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Drawings.
- H. Valves shall be tested hydrostatically, concurrently with the pipeline in which they are installed. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the pressure test(s). If valve joints leak during pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts and hydrostatically retest the joints.
- I. All buried valves shall be wrapped with polyethylene (8mils).

END OF SECTION

## SECTION 331300 - DISINFECTING OF WATER UTILITY DISTRIBUTION

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. Section Includes: Requirements for disinfection and bacteriological testing of potable water piping.
- B. Payment Procedures
  - 1. Water
    - a. Contractor shall pay Owner for water used for disinfection and flushing of new potable water piping.
    - b. Initial water to fill new potable water piping following disinfection will be provided by the Owner. Contractor shall pay Owner for addition water used to repeat disinfection, flushing, and filling.
    - c. Payment for water shall be at Owner's bulk rate.
  - 2. Bacteriological Testing: Bacteriological testing will be provided by the Owner.

## 1.02 REFERENCES

- A. General: References to standards, specifications, manuals, or codes of any technical society, organization or association, or to the Laws or Regulations of any government authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
- B. AWWA Standards
  - 1. AWWA C651 Disinfecting Water Mains

## 1.03 SYSTEM DESCRIPTION

- A. Furnish and install equipment and connections required to complete disinfection of potable water piping as specified in this Section.
- B. Provide labor, services, and equipment required to complete disinfection of potable water piping specified in this Section.
- C. Disconnect and remove equipment, piping, and appurtenances after water mains have been successfully disinfected, bacteriological testing has been completed, and water mains have been approved for connection to existing water distribution system.

1.04 SUBMITTALS

- A. General: As specified in:
  - 1. General Conditions; and
  - 2. Division 1.
- B. Submit copy of permit for flushing water disposal prior to starting installing of pressure piping system.

1.08 PROJECT/SITE CONDITIONS

- A. Bacteriological Clearance: New potable water piping shall not be placed in service prior to receipt of bacteriological clearance from regulatory authority having jurisdiction.
- B. Flushing Water Disposal
  - 1. Obtain permit from South Florida Water Management District prior to starting installation or pressure piping system. Make application and arrangements and pay fees and charges for disposal of discharge from flushing.
  - 2. Submit copy of permit for flushing water disposal.
  - 3. Comply with requirements of permit for flushing water disposal. Meet regulatory requirements relative to disposal of discharge water from flushing.

PART 2 – PRODUCTS

2.01 DISINFECTION SYSTEM

- A. Contractor shall be responsible for the sizing and selection of disinfection system, disinfection equipment, disinfection system piping, and appurtenances.

PART 3 – EXECUTION

3.01 DISINFECTION SEQUENCE

- A. The following shall be done prior to disinfection:
  - 1. Potable water pipe, fitting, valves, and appurtenances shall be installed.
  - 2. Cleaning and flushing of potable water piping shall be completed.
  - 3. Pressure testing of potable water piping shall be completed.
  - 4. Any repairs required on potable water piping shall be completed.
- B. Disinfect and flush potable water piping as specified in this Section.
- C. Following flushing of chlorine solution, samples shall be collected and bacteriological testing shall be performed as specified in this Section.

- D. Do not place potable water piping in service without approval of the Engineer. Piping for dry connections shall be disinfected and installed as specified in Section 02501 Installation of Buried Pressure Piping Systems and placed in service when approved by the Engineer. No other new potable water piping shall be placed in service prior to receipt of bacteriological clearance and approval of the Engineer.

### 3.02 PREPARATION

- A. Obtain approval of Engineer prior to starting disinfection of potable water piping system.
- B. Furnish and install taps and connections required to inject chlorine solution into potable water piping system.

### 3.03 BACTERIAL SAMPLE POINTS

- A. Install bacteriological sample points. Bacteriological sample points shall be as shown on the Drawings.
- B. Provide bacteriological sample points at following locations:
  - 1. Test Sections 1,000 Feet and Smaller: One sample for each section of piping tested placed at farthest point from chlorine injection.
  - 2. Test Section Greater Than 1,000 Feet: One sample for every 1,000 feet of line, places at regular intervals along water pipe section.
  - 3. Dead Ends: One sample at each dead end in section.
  - 4. Other Locations: As shown on the Drawings.
- C. Appropriately located fire hydrants may be utilized for sampling points. Under this circumstance, the Contractor will be solely responsible for maintaining the hydrants in a satisfactory environment for conducting the bacterial testing.
- D. Bacteriological sample points will be utilized by Utilities personnel for water main bacterial clearance procedures.

### 3.04 DISINFECTANT

- A. Disinfect potable water piping with chlorine.
- B. Chlorinating agent shall be as selected by the Contractor and accepted by the Engineer.
- C. Acceptable chlorinating agents include the following:
  - 1. Chlorine gas.
  - 2. Calcium hypochlorite
  - 3. Sodium hypochlorite
- D. Select the chlorinating agent appropriate to the size and length of piping to be disinfected and to the location of piping system. Do not use chlorine gas in residential, commercial, or institutional areas.

- E. Placing chlorine tablets or powder in the piping is not an acceptable method of disinfection.
- F. Provide equipment and feed system for chlorinating agent that is appropriate to the chlorinating agent and the piping to be disinfected.
- G. If disinfection cannot be achieved with system furnished and installed, modify or replace disinfection system, until disinfection of potable water piping can meet the requirements of this Section.

### 3.05 DISINFECTION OF POTABLE WATER PIPING

- A. Fill potable water piping with water containing 50 to 100 parts per million available chlorine. Quantity of disinfectant required for 100 feet of pipe is presented in tables at end of this Section. Tables are to be used only as a guide and are not guaranteed.
- B. Perform disinfection using the following schedule unless otherwise approved by the Engineer:
  - 1. Friday: Inject chlorine solution;
  - 2. Saturday and Sunday: Allow chlorine to remain in piping system.
  - 3. Monday: Flush lines.
  - 4. Tuesday and Wednesday: Collect bacteriological samples.
- C. Feed chlorinating agent at or near the point from which potable water piping is to be filled. Control flow and proportioning of water and chlorinating agent so that specified chlorine concentration is achieved throughout piping to be disinfected. Eliminate air pockets as piping is filled.
- D. Allow chlorine solution to stand in piping for not less than 48 hours.
- E. Operate valves and other appurtenances during disinfection to assure sterilizing mixture is dispersed into all parts of system being disinfected.
- F. Check chlorine residual at sample points after chlorine solution has remained in piping for 48 hours or longer.
  - 1. If chlorine solution contains at least 25 parts per million of chlorine, flush the piping and take bacteriological samples at sample points.
  - 2. If chlorine solution contains less than 25 parts per million of chlorine, flush the piping and repeat disinfection of piping.
- G. Prior to taking samples for bacteriological testing, flush chlorine solution from piping until replacement water has a chlorine content not more than 0.1 parts per million in excess of the residual in water from supplying main.

### 3.06 DISPOSAL OF CHLORINE SOLUTION

- A. After chlorine solution has been retained for the required time, pipes shall be flushed and filled with potable water from distribution system in service.
- B. Discharge water from flushing to storm drain systems in accordance with permit for disposal of flushing water and as specified in this Section.
- C. Reduce chlorine concentration to level that will not harm plants or animals in ditches, streams, canals, ponds, lakes, waterways, bays, estuaries, or any other location that could be impacted by disinfectant discharge. Provide temporary dechlorination tanks, equipment, and chemicals as required to reduce chlorine concentration to level that will not harm plants or animals. Chlorine concentration in discharge to storm drain system shall not exceed 0.1 parts per million.

### 3.07 BACTERIOLOGICAL SAMPLING AND TESTING

#### A. Sampling

- 1. Collect and submit samples for bacteriological analysis.
- 1. Sampling: Water samples for bacteriological examination shall be taken by the Owner after receiving adequate notice, 48 hours minimum, from the Contractor.
- 2. Numbers of samples collected shall meet the requirements of the regulatory authority having jurisdiction.

#### B. Testing

- 1. Bacteriological test shall meet the requirements of AWWA C651.
- 2. Bacteriological test shall be performed by independent testing laboratory certified by State of Florida for bacteriological testing.
- 2. Bacteriological tests shall be performed by the Owner.
- 2. Bacteriological tests shall be performed by regulatory authority having jurisdiction.
- 3. Repeat disinfection and bacteriological testing until piping is approved for service by regulatory authority having jurisdiction.
- 3. Repeat disinfection and bacteriological testing until piping is approved for service by the Owner.

### 3.08 PLACING POTABLE WATER PIPING IN SERVICE

- A. Do not place potable water piping in service until Engineer has approved placing potable water piping in service.
- B. Do not place potable water piping in service until disinfection of potable water piping has been completed and bacteriological clearance for potable water piping has been received.

## Quantity of Chlorine Gas

Required to Produce 50 mg/l of Available Chlorine per 100 feet of Pipe

<u>Pipe Size</u>	<u>Pounds per 100 feet</u>
¾"	0.001
1"	0.002
1¼"	0.003
1½"	0.004
2"	0.007
2½"	0.011
3"	0.015
4"	0.027
6"	0.061
8"	0.11
10"	0.17
12"	0.24
14"	0.33
16"	0.44
18"	0.55
20"	0.68
24"	0.98
30"	1.5
36"	2.2
42"	3.0
48"	3.9
54"	5.0
60"	6.1
64"	7.0

Quantity of Calcium Hypochlorite Solution (70% Available Chlorine)  
 Required to Produce 50 mg/l of Available Chlorine per 100 feet of Pipe

Pipe Size	Pounds per 100 Feet	Ounces per 100 Feet
½"	0.001	0.01
¾"	0.002	0.02
1"	0.003	0.04
1¼"	0.004	0.06
1½"	0.006	0.09
2"	0.010	0.16
2½"	0.015	0.25
3"	0.022	0.35
4"	0.039	0.62
6"	0.087	1.4
8"	0.16	2.5
10"	0.24	3.9
12"	0.35	5.6
14"	0.48	7.6
16"	0.62	10
18"	0.79	13
20"	0.97	16
24"	1.4	22
30"	2.2	34
36"	3.1	50
42"	4.3	69
48"	5.6	90
54"	7.2	110
60"	8.8	140
64"	10	160

## Quantity of Sodium Hypochlorite Solution (5.25% to 14.7% Available Chlorine)

Required to Produce 50 mg/l of Available Chlorine per 100 feet of Pipe

Pipe Size	Ounces per 100 Feet		Quarts per 100 Feet	
	14.7% available chlorine	5.25% available chlorine	14.7% available chlorine	5.25% available chlorine
½"	0.05	0.1	0.001	0.004
¾"	0.10	0.3	0.003	0.010
1"	0.20	0.5	0.006	0.020
1¼"	0.30	0.8	0.009	0.030
1½"	0.40	1.2	0.013	0.040
2"	0.80	2.1	0.023	0.070
2½"	1.2	3.3	0.036	0.10
3"	1.7	4.7	0.052	0.15
4"	3.0	8.3	0.093	0.26
6"	6.7	19	0.21	0.58
8"	12	33	0.37	1.0
10"	19	52	0.58	1.6
12"	27	75	0.83	2.3
14"	36	100	1.1	3.2
16"	47	130	1.5	4.1
18"	60	170	1.9	5.2
20"	74	210	2.3	6.5
24"	110	300	3.3	9.3
30"	170	470	5.0	14
36"	240	680	7.2	21
42"			9.8	28
48"			13	36
54"			16	46
60"			20	56
64"			23	64

END OF SECTION

## SECTION 331600 - SIDEWALKS, CURBS &amp; GUTTERS

## PART 1- GENERAL

- 1.1 WORK INCLUDED: This section covers all formed concrete work reinforced and non-reinforced as required by the Project indicated on the plans or specified by the Engineer. **The Contractor is responsible for all site work and construction supervision required to meet ADAAG/ADA specifications.**
- 1.2 SUBMITTALS DURING CONSTRUCTION:
- A. Submittal during construction shall be made as required in General Requirements.
- 1.3 SUBMITTALS REQUIRED FOR:
- A. Concrete - Submit data sheets
- B. Granular fill - Submit data sheets
- C. Expansion joint fillers - Submit data sheets
- D. Traffic paint - Submit data sheets
- E. Asphalt concrete cold patch - submit data sheets
- F. Asphalt Hot Mix – submit data sheets
- G. Sod - submit data sheets
- H. Stamped and Colored concrete-submit data sheets
- I. Detectable Warnings System:- submit data sheets
- J. Concrete Sealer - submit data sheets
- 1.4 RELATED DOCUMENTS
- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2- PRODUCTS

## 2.1 FORMS:

- A. Materials for curb forms shall be 2-inch dressed dimension lumber, fiberglass, or metal of equal strength, free from defects which would impair the appearance or structural quality of the complete curb. Where short-radius forms are required, 1-inch dressed lumber or plywood may be used. Form material for the face of the curb shall not have any horizontal joints closer than 7-inches from the top of the curb. Provide stakes and bracing materials as required to hold forms securely in place. Metal forms shall be subject to approval by the Engineer. Forms are incidental to the Contract Price.
- B. Materials for sidewalk forms shall be 2-inch dressed lumber straight and free from defects or fiberglass or standard metal forms may be used. Where short radius forms are required, 1-inch dressed lumber is required to hold forms securely in place.

## 2.2 GRANULAR FILL:

- A. Natural sand not having any piece of material larger than 1-inch, free from dirt, clay balls, or organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction and less than ten (10) percent by weight passing the No. 200 sieve. Payment shall incidental to the concrete unit Price bid.

## 2.3 EARTH FILL:

- A. Earth must be free from rocks 2-inches or larger and other foreign materials. Earth fill is incidental to contract Prices. Payment shall incidental to the concrete unit Price bid.

## 2.4 EXPANSION JOINT FILLERS:

- A. Expansion joint fillers shall conform to F.D.O.T. Standard Specifications for Road and Bridge Construction 2004. Submit complete information regarding joint fillers for approval by the Engineer. Payment shall incidental to the concrete unit Price bid.

## 2.5 CONCRETE:

- A. Concrete shall be ready-mixed conforming to ASTM C 94 and shall have a compressive strength of 3,000 psi at 28 days. All exposed aggregate concrete applications shall be comprised of 3 MM – 5 MM maximum size brown river rock aggregate. Limerock aggregate is acceptable for all other concrete applications. Submit complete information regarding mix to the Engineer for review in accordance with the requirements of the referenced ASTM Specification.

## 2.6 DETECTABLE WARNING SYSTEM:

- A. Detectable Warning Systems on walking surfaces shall be “Endicott Handicap Detectable Warning Paver” or equal with raised truncated domes and specified color and must meet federal ADAAG guidelines.

## 2.7 TRAFFIC MARKING PAINT:

- A. Traffic marking paint shall conform to F.D.O.T. Specifications Section 971. Paint for curbs shall be Pride Baker Paint brand traffic marking paint or approved equal. Paint and labor shall be incidental to contract price for replacement markings and the unit price bid for new markings.

## 2.8 ASPHALT:

- A. Cold patch asphalt. Asphalt and labor shall be incidental to the contract price for patches surrounding curbs and sidewalks.

## 2.9 ACCEPTANCE OF MATERIALS:

- A. All materials shall be subject to inspection for suitability, as the Engineer may elect, Prior to or during incorporation into the work.

## PART 3- EXECUTION

## 3.1 EXCAVATION AND BACKFILL:

- A. Cut the existing sidewalk regardless of the thickness, with an approved pavement saw or approved pavement cutter wherever sidewalk edges do not follow straight lines. Saw cutting of concrete shall be wet down to reduce air borne contamination. Remove and dispose of sidewalk at the Contractor's expense.
- B. Prior to excavation of the sidewalk the Contractor's superintendent and the Owner's Engineer or designee shall, together, walk the length of the site marking the limits of the excavation and marking any other pertinent information. Paint shall be supplied by the Contractor, incidental to the cost of the Contract.
- C. At the time of each walk through described in Section 3.1.2, each water meter box and sewer cleanout shall be inspected for structural integrity. Those which are deemed in need of replacement at that time will be supplied by the contractor at the unit price bid or the Florida Keys Aqueduct Authority. Those which meet normal structural and functional standards, and are broken by the Contractor during the construction Process shall be replaced by the Contractor at his cost.
  - 1. Sewer cleanout boxes shall be made from 100% homogenous polyethylene material having a minimum wall thickness of .550 inch, a compartment size of 12-inches by 20-inches with a clear opening of 10-inches by 17-inches. Provide knockouts or notches in each end sized to allow placement of a 6-inch PVC pipe inside the box. Vertical crush to exceed 20,000 pounds and sidewall loading to exceed 180 pounds per square inch. A flange shall encircle the top area for installation in concrete. Cleanout covers shall be cast of ductile conforming to ASTM A-536-84, grade 60-40-18. The meter box covers shall meet or exceed Federal specifications RR-F-621D for a minimum Proof load of 25,000 pounds on 9"x 9" area. All boxes and covers shall be manufactured by Mid-

States Plastics, Mount Sterling, KY. Florida Master Distributor: Ferguson Water Works (561-844-3222) or approved equal.

2. Water meter boxes shall be in accordance with the latest FCAA standards and specifications.

- D. As directed by the Engineer remove any unsuitable material to such a depth that the addition of the sub grade and granular fill can be placed and compacted. Unsuitable material shall consist of and not be limited to top soil, wood, root matter, stumps, trunks, roots or root systems. Excavation that cannot be accomplished without endangering present structures shall be performed with hand tools.

### 3.2 PREPARATION OF SUBGRADE:

- A. Bring the areas on which curbs and sidewalks are to be constructed to required grade and compact to 95 percent ASTM D 1557 by sprinkling and rolling or mechanical tamping. As depressions occur, refill with approved material and recompact until the surface is at the proper grade.

### 3.3 PLACING GRANULAR FILL:

- A. After the sub grade for sidewalks and curbs is compacted and at the Proper grade, spread 4-inches or more of granular fill. Sprinkle with water and compact to 95 percent ASTM D 1557 by rolling or other method. Top of the compacted fill shall be at the proper level to receive the concrete. Granular fill shall be used, when needed, to raise the level of grade to allow for proper thickness of concrete. After spreading fill, compact to 95 per cent.

### 3.4 SETTING FORMS:

- A. Construct forms to the shape, lines, grades, and dimensions as required for proper installation or as called for on the drawings or as directed by the Engineer. Stake wood or steel forms securely in place, true to line and grade.
- B. Forms on the face of the curb shall not have any horizontal joints within seven (7) inches of the top of the curb. Brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. Construct short-radius forms to exact radius. Tops of forms shall not depart from grade line more than 1/8-inch when checked with a ten-foot straightedge. Alignment of straight sections shall not vary more than 1/8-inch in ten (10) feet.

### 3.5 CURB/GUTTER CONSTRUCTION:

- A. Construct curbs to line and grade of curbs and gutters removed, as shown on plans or as established or directed by the Engineer. Curbs shall conform to F.D.O.T. type "D" or "F" or as directed by the Engineer.
- B. Handicap ramps shall be constructed at locations shown on the drawings or as directed by the Engineer and in conformance with legal requirements.
- C. Place preformed asphalt-impregnated expansion joints at intervals not exceeding 100 feet, at the beginning and ends of the curved portions of the curbs and at inlets.

- D. Place contraction joints in the curb at intervals not exceeding fifteen (15) feet. Contraction joints shall be of the open joint type and shall be Provided by inserting a thin, oiled steel sheet vertically into the fresh concrete to force coarse aggregate away from the joint. The steel sheet shall be inserted the full depth of the curb. Place, process, finish and cure concrete in conformance with the applicable requirements of ACI 614, and this Specification. Whenever the requirements differ, the higher shall govern. After initial set has occurred in the concrete and prior to removing the front curb form, the steel sheet shall be removed with a sawing motion. Finish top of curb with a steel trowel and finish edges with a steel edging tool.
- E. As soon as the concrete has set sufficiently to support its own weight, remove the front form and finish all exposed surfaces. Finish formed face by rubbing with a burlap sack or similar device that will produce a uniformly textured surface, free of form marks, honeycombs and other defects. All defective concrete shall be removed and replaced at the Contractor's sole expense.
- F. Upon completion of the curing period, backfill the curb with earth, free from rocks 2-inches and larger and other foreign materials. Tamp backfill firmly in place.
- G. Finished curb shall present a uniform appearance for both grade and alignment. Remove any section of curb showing abrupt changes in alignment or grade, or which is more than 1/4-inch away from its location as staked, and construct new curb in its place at the Contractor's sole expense.
- H. Upon completion of the curing period fill with asphalt any street side holes or ruts in the asphalt paving that was created by the installation of the sidewalk or the curb. When required by Engineer, saw cut, remove and replace sections as directed.
- I. Where curbs that were painted for legal traffic markings (i.e., loading zones, driveways, no parking zones) prior to construction are removed, replaced, repaired or installed. These and any newly constructed curbs and sidewalks shall be repainted by the Contractor. Painting shall be performed upon completion of the curing period, but not less than seven (7) days have elapsed since pouring the concrete. Curbs are to be painted from the inside edge of the curb to the edge of the pavement.

### 3.6 SIDEWALK CONSTRUCTION:

- A. Sidewalks shall be four-inches and driveways shall be 6 inches thick as directed by the City.
- B. Place preformed expansion joints as in the adjacent curb, where the sidewalk ends at a curb, around posts, poles, concrete buildings or walls or other objects protruding through the sidewalk, and at locations shown on the Drawings.
- C. Provide dummy joints transversely to the walks at locations opposite the contraction joints in the curb and at intervals not exceeding five (5) feet. These joints shall be 1/4-inch by 1-inch weakened plane joints. They shall be straight and at right angles to the surface of the walk.
- D. Place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614 and this Specification. Where the requirements differ, the higher shall govern.

- E. Surface finish shall be as depicted on the Landscape Drawings.
- F. Sidewalks shall be placed to slope towards the street at a maximum slope of 2% or as otherwise directed by the Engineer.
- G. Where sidewalks or curbs which were painted for legal traffic markings (i.e., loading zone, driveways, no parking zones) are removed and replaced with new curb or sidewalk or repaired, the Contractor shall be responsible to paint the new portions of the curbs or sidewalks.
- H. Upon completion of the curing period fill with asphalt, any street side holes or ruts in the asphalt paving that were created by the installation of the curbs or sidewalks.

END OF SECTION 321600

## SECTION 332510 - DRILLING OF DRAINAGE WELLS

## PART 1 GENERAL

## 1.1 Requirements

- A. The WATER WELL CONTRACTOR must be licensed as a Florida Water Well Contractor accordance with F.A.C. 62-531. Water Well contractor must have a properly structured State Of Florida Business. The WATER WELL CONTRACTOR shall submit for the Construction / Clearance Permit Application for Class V well to the FDEP.
- B. The WATER WELL CONTRACTOR shall construct each well as shown on the Civil Construction Drawings and Details, and perform all appurtenant work in accordance with the Technical Specifications. The wells shall be constructed with an open-hole completion. The wells shall be complete and operable, in accordance with Chapter 62-528, F.A.C. The Construction of the well shall be in accordance with Chapter 62-523, F.A.C.
- C. Site Sound Proofing: The WATER WELL CONTRACTOR shall furnish sound proofing barriers, provide mufflers on equipment, and undertake other steps necessary during drilling, pumping, testing, and incidental operations, to ensure that noise levels conform to all applicable noise ordinances.
- D. Access Control: The WATER WELL CONTRACTOR shall undertake necessary measures to limit access to drilling sites, to minimize public hazards.
- E. Sequence of Work: The sequence may be changed by the ENGINEER. Change may include alternations to the order of occurrence, deletions, or additions. The WORK schedule and operations shall continue without interruption until all WORK is completed by the CONTRACTOR.
  1. Preparation and Mobilization shall be completed as specified in Mobilization Section, including, but not limited to:
    - a. Site and access video
    - b. Clear site and establish vertical and horizontal control with reference to NGVD 1929.
    - c. Install temporary services, as needed
    - d. Mobilize drilling rig and provide temporary piping for water supply and disposal.
    - e. Prepare Onsite staging areas and disposal sites as needed
  2. Drill Bore Hole including open hole to depth of 120 feet below top of casing elevation specified on the project plans. Overdrill shall be a minimum of 6 inches greater than the outside diameter of the well casing at the casing joint.
  3. Provide lithology description and casing seat request to FDEP.
  4. Install Casing upon Approval from FDEP.
  5. Notify FDEP in Fort Meyers (David Rhodes, P.G.) and Marathon (Steve Johnson) at least 72 hours prior to grouting.
  6. Grout Casing.

7. Install temporary cap on well.
8. Process Certification for well completion. Provide AS-built drawings to Engineer
9. Attach storm water / pretreatment structures as required.
10. Clean site / demobilize.

F. Personnel Requirements

1. The WATER WELL CONTRACTOR shall furnish capable personnel, experienced in the work required to construct the Class V injection well(s).
2. The Drill Rig Operator shall work under the direct supervision of the Florida licensed WATER WELL CONTRACTOR, using equipment that is under the direct control of the Florida licensed WATER WELL CONTRACTOR. The Florida Licensed Water Well Contractor is required to be onsite to supervise the well construction operation.
3. The Drill Rig Operator shall maintain the drilling equipment, pumps, and drill pipe. The driller shall be competent in the use and application of drilling fluids and additives.
4. The Drill Rig Operator shall monitor the progress of the drilling operation, and keep the record of the rate and progress of drilling, development and pump testing operations, including well logs and reports. The daily reports shall be submitted with the water well contractor's portion of the well completion report.
5. The Drill Rig Operator shall be capable of recognizing and making lithologic classifications of the formations to be encountered during the drilling. The Drill Rig Operator shall ensure that the necessary amount of overdrill is determined and executed to ensure that the 60 feet of casing and grout below land surface is accomplished along with ensuring the required amount of casing is provided above the land surface according to the Civil Engineering Drawings.
6. The Cementing Supervisor shall have a working knowledge of down hole pumping, an understanding of displacement, volume of cement, pump pressure, bottom hole pressure, casing lift pressure. Cementing Supervisor shall ensure that casing collapse pressure is not exceeded.

1.2 Related Documents

- A. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

1.3 Record Keeping, Well Logs, and Reports

- A. General  
DRILLING OF DRAINAGE WELLS

1. The WATER WELL CONTRACTOR shall establish horizontal and vertical (top of casing elevation) control by a licensed land surveyor in the State of Florida.
  2. The WATER WELL CONTRACTOR shall ensure the depth of the well as shown on the construction plans is established. The depth of the well is measured from either the actual surveyed land surface or the surveyed top of casing in a pretreatment structure if applicable.
  3. Measurement of the total well depth (including open hole) shall be accomplished by using a heavy duty tape measure or cord with a weight attached to the end. The tape measure shall be lowered to the bottom of the hole, maintaining a vertical alignment. Tape should be read or cord marked equal to the top of the casing elevation. If cord used, measure the cord length. Contractor can submit alternate method to Engineer and FDEP for approval if desired.
- B. Drilling Log: The WATER WELL CONTRACTOR shall maintain the Drilling Log. The report forms shall include, at a minimum, location of well, county, TSR, street address, property owner name and address, well depth, method of drilling, lengths and numbers of drill rods used, well use, casing type, grout type used, method of installation, depth of installation, bucket assembly information, drilling additives, fluid losses, water and fluid level changes, footage drilled and formations encountered, and cementing operations, pump information, and a record of any situation encountered (well stuck, collapse of hole).
1. The Drilling Log shall detail the cutting and disposal method, listing the quantity of cuttings, storage location onsite, and transport and final disposal site. The Final Disposal site shall be approved by FDEP. A letter shall be sent to FDEP providing the site owner's permission to use the site for cutting disposal.
  2. The Drilling Log shall list information relating to maintenance and repair of the drilling rig.
  3. The Drilling Log shall be available on site for inspection at all times.
  4. The Drill Log in this specification section can be used or a contractor log submitted to the Engineer for approval can be used. The Drilling Log does not eliminate or replace the well completion report required to be submitted to the water management district, and the certification of class five well construction completion to be submitted to FDEP. The Drilling log shall be included in the water well contractor's completion report.
- C. Record Drawing: The final well description shall conform to the permit drawings and specifications, any deviations from the originally permitted design drawings shall be noted and accompanied by written approvals from FDEP. The record drawing shall show the final diameter, wall thickness, depth and length of the casing, borehole diameter, cemented casing, depth and thickness of annular seals, pretreatment structure and piping, quantity of material removed during development operations, and all other pertinent details. The Record Drawings shall be updated by the well contractor if needed with the actual constructed well information and be submitted with the Engineer's Certified Completion Report.
- D. Records Required by Law: The WATER WELL CONTRACTOR shall maintain all records required by governmental agencies having jurisdiction, and shall submit such records to as may be required. Two copies of all records and submitted material shall be furnished to the ENGINEER.
- E. Permits: The WATER WELL CONTRACTOR shall apply for all necessary drilling and testing

permits with local and state regulatory agencies. The WATER WELL CONTRACTOR shall be required to provide certain information to the permitting agencies, in order to complete the permitting process. It is the WATER WELL CONTRACTOR's responsibility to obtain any and all other permits associated with the drilling and testing of the well.

- F. Completion Report: A Well Completion Report (Form 62-528.900(4)) must be filed with the permit issuing agency along with a signed copy of the well completion report from the water management district within thirty (30) days of well completion. The well completion report and the as-built drawings that the WATER WELL CONTRACTOR has updated should be submitted together. The as-built drawings of the injection well and the associated site stormwater structures are required to be reviewed, and signed and sealed by the engineer of record.
- G. Grout: Samples of grout shall be collected during the cementation of all casings, with the CONTRACTOR collecting dry and mixed samples of the cement being used. Mixed cement samples shall include at least three (3) 2-inch cubes suitable for tests of compressive strength.
1. Grout samples shall be collected a minimum of three (3) times during each cement stage: Prior to pumping, at the middle and at the end of the stage. The specified slurry density shall match the specified slurry density indicated on the delivery certificate, if grout is not mixed on site.
  2. Only 2-inch cubes, suitable for tests of compressive strength, will be acceptable as representative cement samples.
- H. Calibration Data: Calibration records for each measuring instrument used in the construction of the well shall be submitted to the ENGINEER for review prior to the installation or use of the instruments. Calibration of instruments shall have been performed within 45 days prior to use in testing. All calibration records shall be submitted to the ENGINEER prior to use. The calibration records shall contain the following information:
1. Meters: The CONTRACTOR shall supply flowmeters and other meters for use in testing the well. The flowmeter for use in the pumping test shall have major gradations of 100 gpm and minor gradations of 10 gpm. Accuracy shall be  $\frac{1}{4}$  of 1 percent of full scale.  
Serial number, model number, gears, test apparatus size, meter reading and flow rate for at least three (3) steps, percent error for each step, and tester's name and title must be included in the submittal.
  2. Gauges: The pressure gauges used in pressure tests shall have 0 to 50 psi scales with major gradations of 10 psi and minor gradations of 0.5 psi or smaller. Pressure gauges for use during aquifer tests, if required, shall have scales from 0 to 50 psi with 1 psi gradations. Gauge accuracy shall be  $\frac{1}{4}$  of 1 percent of full scale.  
The gauge's serial number, model number, scale range, meter reading and inches of mercury for at least three (3) steps covering the entire range of the gauge, percent error for each step, and tester's name and title must be included in the submittal.

#### 1.4 Quality Insurance

- A. Remedial Work: Remedial work performed prior to final acceptance, as required to meet the regulatory requirements or the Technical Specifications, due to defective materials, accident, loss of equipment or equipment malfunction, or any other cause directly attributable to the WATER WELL CONTRACTOR's actions or inaction, shall be performed by the WATER WELL

CONTRACTOR at the WATER WELL CONTRACTOR's expense deemed as required.

In the event of a problem, the ENGINEER, and FDEP shall be notified immediately, and the following shall apply:

1. The WATER WELL CONTRACTOR shall propose a method of correcting the problem, to the ENGINEER, and FDEP. The ENGINEER, FDEP and OWNER shall review the proposed method of corrective action. Only after approval from the ENGINEER, and FDEP shall the corrective action plan be implemented.
  2. All work on the well must be in accordance with the applicable local, state, and federal regulations.
  3. If the well is deemed unacceptable by the ENGINEER, it shall be abandoned and backfilled by the WATER WELL CONTRACTOR, after obtaining a permit, at contractor's expense, for plugging and abandonment of the well from FDEP. The WATER WELL CONTRACTOR shall not be paid for services and work deemed incomplete or unacceptable. Reason for the well deemed unacceptable shall be provided to FDEP.
- B. Repeat Work: All work repeated as a result of the WATER WELL CONTRACTOR's performance shall be furnished at the expense of the WATER WELL CONTRACTOR. No claim for additional compensation shall be made or be allowed, including all materials, labor, and equipment costs. FDEP Approval shall be obtained prior to and repeat work being done.
- C. State Standards: Department of Environmental Protection Rules and Regulations for UIC Wells in Chapter 62-528, Florida Administrative Code (F.A.C.).
- D. Commercial Standards: All work specified herein shall conform to or exceed the requirements of the applicable codes and standards, relating to the referenced portions of the following documents, only to the extent that the requirements therein are not in conflict with the provisions of this section. Where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such a code or ordinance shall take precedence.

Commercial Standards:

ASTM C 150	Specification for Portland Cement.
ASTM D 1784	Specification for Rigid PVC Compounds and Chlorinated PVC Compounds.
ASTM D-2564	Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
ASTM F 480	Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), Sch 40, and Sch 80.
AWWA A 100	Standard for Water Wells.

- E. Guarantee: The WATER WELL CONTRACTOR guarantees that the workmanship, materials and equipment supplied or used in the execution of work to be free from defects and flaws. The WATER WELL CONTRACTOR further guarantees that the performance test requirements shall be fulfilled. The WATER WELL CONTRACTOR shall repair, correct, or replace all damaged

work covered by failures under the guarantee, at the WATER WELL CONTRACTOR's expense, only AFTER approval from FDEP. The guarantee shall remain in effect for a period of five (5) years from the date of final acceptance by the OWNER.

- F. **Abandonment of Well by Contractor:** If, at any time the WATER WELL CONTRACTOR voluntarily stops work, and/or fails to complete the bore hole in a satisfactory manner, in accordance with governing regulations, the bore hole will be considered abandoned. The WATER WELL CONTRACTOR shall not be paid for all or part of a bore hole declared as abandoned by the OWNER.
1. The cost of properly plugging and sealing the well or bore hole, in accordance with applicable local, state or federal regulations, shall be paid by the WATER WELL CONTRACTOR
  2. All salvageable material furnished by the WATER WELL CONTRACTOR may be removed and remain his property, after approval from FDEP.
  3. The WATER WELL CONTRACTOR shall propose his method of abandonment of the well or bore hole, in writing to the ENGINEER. The WATER WELL CONTRACTOR shall apply for and obtain an Application for Class V Well Plugging and Abandonment Permit. The ENGINEER, and FDEP shall review the method of abandonment. The FDEP and the ENGINEER'S approval of the plan must be obtained, in writing, prior to the implementation of the abandonment plan. All work on the well must be in accordance with all applicable local, state, and federal regulations.
- G. **Abandonment of Well by OWNER:** If information indicates that the completion of a well on the site is not warranted, the OWNER reserves the right to terminate all further work at the site. In such an event, the WATER WELL CONTRACTOR will be paid the value of work completed to that time, based on standard unit prices.
1. The WATER WELL CONTRACTOR shall be required to abandon the bore hole, as directed by the ENGINEER, in accordance with regulations formulated by governmental agencies having such jurisdiction, including Chapter 40D-3.531 F.A.C. The WATER WELL CONTRACTOR shall apply for and obtain an Application for Class V Well Plugging and Abandonment Permit. Costs associated with the abandonment will be paid by the OWNER.
  2. The OWNER reserves the right upon termination of work on the site to have the WATER WELL CONTRACTOR move to another location on the site selected by the OWNER to drill another bore hole. The location must be approved by the ENGINEER and FDEP. In such circumstances; The WATER WELL CONTRACTOR shall apply for and obtain an Application for Class V Well Plugging and Abandonment Permit. Costs associated with the abandonment will be paid by the OWNER. FDEP shall be advised prior to relocation of the well. If deemed necessary by FDEP, a permit modification will be done at the OWNER's expense.
- H. **Environmental Considerations:** All regulated materials, liquids and/or substances shall be stored within secondary containment, in compliance with applicable regulations of the State. It is the responsibility of the WATER WELL CONTRACTOR to obtain the regulated materials list from the appropriate State office and to provide the ENGINEER with an inventory of all regulated materials to be used on the job site. The integrity of the secondary containment area shall be demonstrated by the WATER WELL CONTRACTOR for the ENGINEER, upon request. At any time if existing contamination either is soil or water is found to be above state of federal limits; work shall be stopped and the ENGINEER and FDEP notified of the finding. Work shall only proceed with authorization from the ENGINEER and FDEP.

### 1.5 STORAGE AND PROTECTION OF MATERIALS

- A. General: All materials shall be delivered in an undamaged condition and stored to provide protection against damage. All defective or damaged materials shall be replaced with new materials.
- B. Defective Materials: Materials that are defective or damaged prior to use are unacceptable and shall be replaced with new materials, at the WATER WELL CONTRACTOR's expense.
- C. Drilling Waste Disposal: Prior to beginning drilling operations, the CONTRACTOR will submit to the ENGINEER verification of his disposal site in writing from the FDEP. The CONTRACTOR shall be responsible for providing and maintaining all necessary trucks, pipe, pumps, and equipment necessary to pump and haul excess drilling fluid, drill cuttings, and produced water to a pre-determined disposal site(s) in accordance with federal, state and local regulations, or subcontract with a firm capable of providing these services when necessary.
- D. Field Relocation: During construction, it is expected that minor relocation of proposed facilities may be necessary. Field revisions will only be made at the direction of the ENGINEER. If existing structures are encountered that prevent construction as shown, the WATER WELL CONTRACTOR shall notify the ENGINEER prior to continuing work. All relocations must be communicated to FDEP prior to relocating the well. Relocations within a 10 foot radius generally will not require written FDEP approval. Relocations outside of the 10 foot radius will require approval, in writing; and some cases may require a permit modification prior to work commencing at the selected site.
- E. Storage Area: The WATER WELL CONTRACTOR shall prepare an area, within the limits of a location approved by the ENGINEER, for the storage of materials required for this work.
- F. Protection: The WATER WELL CONTRACTOR is responsible for protecting his own work from theft, vandalism, and unauthorized entry.

### 1.6 CONTRACTOR EQUIPMENT

- A. General: The WATER WELL CONTRACTOR's equipment shall be clean, well maintained, and in good operating condition when delivered to the site and during the entire operation.
  - 1. The equipment shall be of adequate size, strength, horsepower, and capacity for the project and shall be of the type successfully utilized for the construction of similar or larger wells.
  - 2. All equipment shall be provided with safety devices, as required by governmental authorities having jurisdiction.
- B. Equipment Use: Reaming and setting of casing shall be done with the same equipment. No resetting of equipment will be allowed after the bore hole is reamed.
- C. Equipment Operation: All equipment shall be carefully maintained during the WATER WELL CONTRACTOR's operations. Any damage to the well or surrounding property and/or facilities, due to the WATER WELL CONTRACTOR's operations shall be repaired or replaced.
- D. Safety Equipment: The WATER WELL CONTRACTOR must provide and utilize safety

equipment, as required by all applicable federal and state regulations.

#### 1.7 MOBILIZATION AND SITE RESTORATION

- A. Mobilization: The WATER WELL CONTRACTOR shall mobilize its equipment and personnel to effectively commence its drilling operations, within the specified time limit.
- B. Unused Materials and Equipment: During construction, the WATER WELL CONTRACTOR shall regularly remove all accumulated debris and surplus materials. Unused tools or equipment shall be stored at the WATER WELL CONTRACTOR's yard or base of operations.
- C. Periodic Cleaning: The WATER WELL CONTRACTOR shall perform clean-up work on a regular basis and as requested by the ENGINEER.
  - 1. Basic site restoration shall be accomplished immediately following installation or substantial completion, or as directed by the ENGINEER.
  - 2. If the WATER WELL CONTRACTOR fails to perform periodic clean-up and basic restoration of the site to the ENGINEER's satisfaction, the ENGINEER may, upon five days written notice to the WATER WELL CONTRACTOR, employ such labor and equipment as he deems necessary for this purpose, at the WATER WELL CONTRACTOR's expense.
- D. Protection of Water Quality: The WATER WELL CONTRACTOR shall take all necessary precautions to prevent contaminated water, gasoline, or other hazardous substances from entering the ground, either through the well or through seepage from ground surface. The WATER WELL CONTRACTOR shall maintain precautions during and after construction of the well, and until acceptance of the well by the OWNER. If the WATER WELL CONTRACTOR fails to prevent contaminants from entering the groundwater, remedial action, as required by the governing regulatory agencies shall be performed by the WATER WELL CONTRACTOR, at the sole expense of the WATER WELL CONTRACTOR. A temporary well cap shall be installed on the well casing, when the well is complete, until the baffle box is connected to the well. The Contractor shall ensure the well cap is maintained on the well.
- E. Work Completion and Final Cleanup: Upon completion of work, the WATER WELL CONTRACTOR shall promptly remove all his equipment and unused materials, from the drill site, approved storage areas and approved disposal sites. He shall dismantle any temporary structures erected for his purposes that are not part of the final product. He shall promptly effect minor repairs. The WATER WELL CONTRACTOR shall thoroughly clean the drill site, and approved storage areas. All excess drilling fluids, debris, and other materials used during construction shall be removed and disposed of, by the WATER WELL CONTRACTOR. Mud sumps and other work excavations shall be filled, compacted, graded, and the site returned to a condition equal to or better than its condition at the start of the work. These requirements must be completed within one month after the completion of drilling and testing.

## PART 2 PRODUCTS

Products are listed and described throughout Part 3 Execution. Products shall conform to all requirements of Part 1 General.

## PART 3 EXECUTION

### DRILLING OF DRAINAGE WELLS

### 3.1 GENERAL

Changes from the specifications as permitted by FDEP, shall require FDEP concurrence and written approval via a permit modification if deemed necessary by FDEP. All changes from FDEP permit specifications require notification and concurrence from FDEP.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of well construction.

The depths and lengths for boreholes and casings shall be as shown on the drawings, unless otherwise determined by the ENGINEER. Payment will be based on actual quantities furnished, installed, or constructed, in accordance with the schedule of values.

All work required to be repeated, resulting from the WATER WELL CONTRACTOR's performance, or lack thereof, including all additional materials, labor and equipment required, shall be furnished at the expense of the WATER WELL CONTRACTOR. No claim for additional compensation shall be made or allowed, except as specifically provided herein.

Well drilling shall begin after approved maintenance of traffic, if applicable.

### 3.2 DRILLING AND REAMING OPERATIONS

- A. Drilling: The WATER WELL CONTRACTOR shall take all measures necessary to protect the top portions of the test hole from caving or raveling.
- B. Centralizers: Verification of the casing to be centered shall be done. Centralizers shall be used on the pipe to ensure the alignment of the casing and an even distribution of grout around the casing. Centralizers shall be placed every 20 feet.
- C. Casing: The first 60 feet, cased part of well, shall be drilled with 6" overdrill. Upon reaching 60 feet or elevation at which the casing will be seated; the open hole shall be drilled. To drill open hole the WATER WELL CONTRACTOR shall center the drill rig in the drilled hole, and drill the open hole at 22 inch diameter.
- D. Rotary Bucket Auger: The drilling fluid shall possess such characteristics as are required to adequately condition the walls of the hole to prevent caving as drilling progresses, and to permit recovery of representative samples of cuttings.
  - 1. Only fresh water from the designated source shall be used in drilling fluids whether employed alone or in combination with drilling additives. Any other drilling additives to be used will require acceptance by the ENGINEER.
  - 2. The WATER WELL CONTRACTOR shall maintain complete control over drilling fluid characteristics during the entire operation of well construction. If proper control of the drilling fluid is not maintained, the WATER WELL CONTRACTOR may be required, at the WATER WELL CONTRACTOR's expense, to retain or employ an experienced, qualified mud engineer on the job during all operations, to supervise and maintain drilling fluid characteristics.
  - 3. The WATER WELL CONTRACTOR shall provide holding tanks for handling the drilling fluid. The WATER WELL CONTRACTOR shall provide adequate protection for

the public at all times. Upon completion of the drilling, drilling mud and cuttings from the well shall be removed from the approved staging site and disposed of by the WATER WELL CONTRACTOR. The ground surface shall be restored to its original condition.

4. All additives shall be approved by the ENGINEER, prior to use.
  5. If large boulders are encountered that are larger than the bucket, the use of common drilling tools, orange-peel bucket, or stone tongs shall be used to remove the boulder.
- E. Drilling Method: The well shall be drilled using the Rotary Bucket Auger Method. Alternative methods can be submitted with the FDEP Construction permit. Alternative method has to be approved by ENGINEER also.
- F. Drilling Samples: The WATER WELL CONTRACTOR shall collect representative drill cutting samples every 15 feet and labeled with the well ID, date, depth, and stored in 1 pint permeable cloth soil sample bag.

### 3.3 CASING

- A. Casing Installation: When the reaming operation has been completed, casing will be installed. The casing lengths will be 20 feet sections.
- B. Seating Casing: Casing seat request shall be sent to FDEP (David Rhodes, Ft. Myers Office) along with lithology description. Seat request shall include the requested casing seat elevation. Casing to be set only with FDEP approval.
- C. PVC Casing: The casing shall be un-plasticized PVC compounds having a minimum cell classification of 12454-B, as defined in ASTM D 1784. PVC pipe used for well construction or repair shall at a minimum meet the specifications for Standard Dimension Ratio (SDR) 21. All PVC pipe used for well casing shall be new, factory assembled in 20-foot lengths. Shorter pieces will be allowed at the end of the casing if required to ensure the 60 feet of casing is provided. Amount of casing installed shall account for the overlap of bell ends that are on the casings when joined. The CONTRACTOR shall install additional casing to account for the bell ends so that the designed depth of 60 feet is obtained. Additional casing shall be readily available if more than 60 feet is required to seat the casing.
- D. Tension: The casing shall be suspended in tension from the surface. The bottom of the casing shall be at a sufficient distance above the bottom of the reamed hole as to insure that none of the casing will be supported from the bottom of the hole. The casings shall be lowered into the borehole open-ended, and the weight of the casing shall be supported by the drilling rig. The hook load of the drilling rig must exceed the maximum casing weight to be encountered during construction of the well. The method used to join the casings together, shall be able to withstand the tension pressures without separation during the casing installation procedure.
- E. Failure to Complete: If the casing cannot be landed in the correct position or at a depth acceptable to the ENGINEER, the WATER WELL CONTRACTOR shall construct another well immediately adjacent to the original location, and complete this well in accordance with the Civil Construction Drawings, Details, and Technical Specifications. The abandoned hole shall be permitted and approved before being sealed, in accordance with all State of Florida regulations.
- F. Collapsed Casing: Should the casing collapse for any reason prior to well completion, FDEP shall be notified. Casing can be withdrawn and replaced at the WATER WELL CONTRACTOR's expense only after FDEP approval.

### 3.4 GROUTING OF CASING

- A. General: After installation of the casing, the annular space between the borehole wall and the casing shall be filled with cement grout from the bottom of the casing to the ground surface. The cement shall be pumped as a slurry of thoroughly mixed components, in stages that are designed to fill the annular space without exceeding the collapse pressure of the casing pipe to which the cement is applied. It is the WATER WELL CONTRACTOR's responsibility to conduct the cementing operations in such a manner that the burst/collapse strengths of the casing (with safety factor) are not exceeded and casing failure does not occur. Cement will be pumped or placed so that the pressure of the slurry and the pressure applied inside the casing pipe do not affect the bond.

A cement basket shall or packer assembly shall be used at the bottom of the casing to provide a seal for the grout on the bottom of the annulus.

Grout shall be placed into the annular space using the pressure grouting technique using a tremie pipe. The grout shall be pumped under pressure from the bottom of the casing. In the event the borehole collapses prior to placement of the grout seal, the WATER WELL CONTRACTOR shall take whatever steps are necessary to re-open the hole and place the seal as specified.

Material used in the casing seal shall be neat cement grout, consisting of Type I or Type III Portland cement, conforming to ASTM C-150. Neat cement grout shall contain between 5.0 and 6.0 gallons of water per 94-pound sack of cement, with a slurry density of 15.0 to 15.5 lbs/gallon. .

Additives may be added to the sealing material to speed the setting time or expand the material. Additives shall not exceed the follow:

- Not more than 2 percent, by weight, calcium chloride.
- Not more than 4 percent, by weight, bentonite.

No other additives will be allowed, unless approved by the Department, in writing, prior to use.

The WATER WELL CONTRACTOR will be responsible for adding or releasing water from the casing to maintain the required pressure.

Minimum setting time between stages is 8 hours, if more than one stage is required. The well shall remain undisturbed for at least 24-hours after cementing of the casing is complete.

### 3.5 PVC CASING JOINTS

- A. PVC Casing Joints: Where specified, casing joints shall be attached in accordance with the requirements of ASTM F-480. Pipe shall be joined using a pipe cement that meets the requirements of ASTM D-2564. No external pipe-to-pipe restraining devices that clamp onto or otherwise damage the pipe surface as a result of point-loading shall be permitted. The CONTRACTOR is responsible for ensuring the suitability of all connections for the well casing string and associated work.

### 3.6 DISPOSAL

- A. Water Disposal: The WATER WELL CONTRACTOR shall remove all pumped water and Spoils produced during reverse air drilling, well development, and testing, from the well site to an

FDEP approved location. The WATER WELL CONTRACTOR shall design a system that protects the site from erosion. The system shall settle the discharge water so that turbidity is 0 NTU. The WATER WELL CONTRACTOR shall be responsible for meeting local, state and federal requirements for discharge of water produced during drilling, development, and testing.

1. The WATER WELL CONTRACTOR shall conform to all waste discharge requirements, and shall obtain all required permission, if necessary, to discharge waters into a flood control storm drain. All actions necessary to conform to the discharge requirements shall be performed by the WATER WELL CONTRACTOR, as a part of his scope of work and contract.
  2. If necessary to avoid erosion, minimize area flooding, promote settling of turbid water, conform to County, City, State or Owner requirements, the WATER WELL CONTRACTOR shall be responsible for providing on-site tanks or a constructed basin of sufficient size and construction to accommodate development and pumped discharge from the well. The tanks or basin shall be constructed with baffles to encourage sediment settlement.
  3. Discharge piping shall be equipped with an in-line meter with 6-digit, straight reading totalizer, registering in units of 100 gallons, together with a rate of flow indicator dial, which reads in units of gallons per minute, and is suitable for the expected flow range. Any necessary crossings over discharge piping shall be constructed and maintained by the WATER WELL CONTRACTOR.
- B. A Cuttings, fluids and mud Disposal Plan will need to be submitted and approved by FDEP prior to construction of the wells. A letter from the property owner indicating understanding and acceptance of the materials onto the property will be required.

#### PART 4 PAYMENT

##### 4.1 GENERAL

- A. No final payment will be made until Well Certificates are submitted to applicable permitting agencies and certified as-builts are received. Payment for work specified in this section will be made per computation of quantities as indicated for each item and shall be considered full compensation for furnishing all labor, materials, and equipment to complete the work as specified under this section.



## SECTION 332520 - STEP DRAWDOWN PUMPING TEST

## PART 1 - GENERAL

## 1.1 WORK INCLUDED

- A. This Section covers the work, materials, and equipment necessary for testing, for furnishing, setting, operating, and removing test pumps from the wells, complete including any traffic routing or other work associated with the testing and routing of the discharge water.

## 1.2 SUBMITTALS

- A. Submit descriptions and diagrams (if necessary) of two devices for measuring discharge flows and pressures.
- B. Submit proposed method of routing fluid discharge from the well to the disposal point.

## 1.3 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 - PRODUCTS

## 2.1 GENERAL

- A. All testing equipment shall be in good operating condition at all times and operated and maintained in strict conformance with manufacturer's recommendations.
- B. The CONTRACTOR shall have the appropriate equipment and trained personnel to perform the work as specified.
- C. The CONTRACTOR shall be solely and directly responsible to the OWNER for any damage caused to OWNER's property by CONTRACTOR's operations.

## 2.2 STEP DRAWDOWN PUMPING TEST EQUIPMENT

- A. Furnish, install, and operate a horizontal centrifugal or submersible test pump, driver, and discharge piping capable of pumping 1800 gpm at 80 feet of total dynamic head (TDH) from a nominal 24-inch diameter well.
- B. Provide a butterfly valve, or gate valve, or equal on the discharge side of the pump for adjustment of flow

rate.

- C. The pumping unit prime mover (e.g. engine drive) controls, and appurtenances shall be capable of being operated without interruption for 12 hours.
- D. Electrical power is not available at each well site. It shall be the responsibility of the CONTRACTOR to supply the necessary power for the pump test. Any additional wires, adapters, GFCI receptacles, etc., are the responsibility of the CONTRACTOR.
- E. Provide machined orifice plate(s), piezometer tube, and calibrated (within the last 60 days) flowmeter(s) devices capable of measuring the pump discharge within plus or minus 5 percent of true flow or flow rates from 500 gpm to 2,000 gpm. Provide at least two methods of measuring the flow. The type of device shall be submitted for approval by ENGINEER prior to mobilization.
- F. Furnish, install, maintain, and operate discharge piping for the pump unit or sufficient size to conduct pumped water to the disposal location specified herein and as approved by the ENGINEER.
- G. Provide a minimum clearance of 3 inches between the horizontal centrifugal suction pipe or submersible pump column pipe and the 24-inch well casing will allow the ENGINEER to measure water levels with a water level recorder above the well vaults.
- H. The CONTRACTOR shall provide a calibrated, electric water level probe for water level measurements during testing. The unit shall be a Hemit Model 1000 by In-Situ, or approved equal.

2.3 DOCUMENTATION

- A. ENGINEER shall be responsible for collecting and recording water levels (reference point, static depth to water, pumping depth to water, etc.) and SDI measurements. CONTRACTOR shall provide ENGINEER with the following additional data from each step drawdown pumping test.
  - 1. Date and time the test was started.
  - 2. Pressure and discharge rate at 15-minute intervals.
  - 3. A sample data reporting form is provided at the end of this section.

PART 3- EXECUTION

3.1 STEP DRAWDOWN PUMPING TESTS

- A. Perform Four Step Drawdown Pumping Tests on Each Well:

Step	Flow Rate (gpm)	Duration (Minutes)
1	600	180
2	1000	180
3	1400	180
4	1800	180

- B. The ENGINEER or OWNER shall record data from each test as specified on the Sample Data Reporting Form provided at the end of this Section.

- C. For this purpose, the CONTRACTOR shall operate the pump without interruption, at no more than two percent fluctuation in the designated rates of discharge, during the full period of the step-drawdown test as determined by the ENGINEER. If the pumping test is started and then must be stopped due to equipment breakdown, failure of any water level recorder, or inadequate supervision by the CONTRACTOR, no extra payment shall be made for the time spent pumping before the test is restarted. If any part of the pumping equipment fails to operate properly, or impairs the proper functioning of another element or instrument involved in the test, the equipment shall be removed and repaired at the expense of the CONTRACTOR and no extra payment shall be made for the delay.

### 3.2 INSTALLATION OF PUMPING EQUIPMENT

- A. A test pump, flow measuring devices, discharge piping, level measuring devices, and other necessary appurtenances shall be installed in the well when requested by the ENGINEER. The test pump discharge pipe, and appurtenances to be provided by CONTRACTOR shall be free of sand and other visible deleterious material from the pump assembly prior to installation.

### 3.3 DISPOSAL OF WATER

- A. All water produced during step drawdown pumping test shall be disposed of in an appropriate manner in accordance with all applicable regulations and requirements.
- B. Disposal of water shall include, but be limited to:
1. Discharge to nearby canal.
  2. Discharge to storm or sanitary sewer.
  3. Collection of water in storage tank for offsite disposal by CONTRACTOR.
  4. Other method to be determined by the CONTRACTOR and approved by the ENGINEER and OWNER.
- C. For each of these methods of disposal, it is the CONTRACTOR's responsibility to obtain written permission or approval from the responsible agency or government entity to dispose of the water.
1. Storm or Sanitary Sewer: City of Key West.
  2. Disposal Offsite: Copies of manifest and/or written permission from hauling companies and disposal locations.
  3. Other: CONTRACTOR to provide written permission or approval from entity
  4. accepting disposal of the water.
- D. It is the CONTRACTOR's responsibility to examine each well site and develop a written plan for disposal of the water prior to pumping of any water. The plan shall include at a minimum well number(s), methods of disposal, quantity or rate limitations, location of disposal pointy, and written permission or approval from responsible agency or government or private entity. The plan shall be reviewed and approved by the ENGINEER and OWNER.
- E. Provide all equipment and appurtenances necessary to dispose of the water in accordance with the requirements of the permits or appropriate responsible agency or government or private entity.

### 3.4 SUPPLEMENTS

- A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Step Drawdown Pump Test Data

END OF SECTION 332520

<b>Step Drawdown Pump Test Data Sheet</b>			
Well _____		Water level reference point _____	
Date _____		Static Depth of Water (DTW) (feet) below reference point) _____	
Time _____			
Personnel _____			
Minutes	DTW (feet)	GPM	PSI
0			
15			
30			
45			
60			
75			
90			
105			
120			
135			
150			
165			
180			

## SECTION 333113 – SANITARY SEWER PIPING

## PART 1 GENERAL

## 1.1 WORK INCLUDED

- A. This section covers all work necessary for furnishing and installing 8 to 15-inch pipe for the repair and replacement of gravity sanitary sewers and providing new gravity sewers as shown on the Drawings. Service connection pipe is specified in Section 333923, SANITARY SERVICE CONNECTIONS.

## 1.2 SUBMITTALS

## A. Shop Drawings:

1. The CONTRACTOR shall submit catalog cuts, specifications, dimensioned drawings, installation details and sketches, and other pertinent information for the sewer pipe installation work. All materials provided shall be fully in accordance with the requirements of the reference specifications specified above.
  2. The CONTRACTOR shall verify with the pipe manufacturer all connection details.
  3. The CONTRACTOR shall submit detail drawings and a written description of the construction procedure and sequence including its locations to bypass insertion and receiving bypass sewage flow of the host sewer and service laterals, install new host sewer and service laterals, and disconnection and reconnection of the sewer service lateral connections.
- B. Certification: The CONTRACTOR shall furnish a certified affidavit of compliance for all sewer pipe and fittings furnished confirming that the materials supplied fully conform to the requirements specified herein.
- C. The CONTRACTOR shall submit a complete plan for a sewage bypass pumping system for review by the ENGINEER at least 20 working days prior to pipe installation. The plan shall be approved by the ENGINEER before pipe installation. The sewage bypass pumping system shall include an emergency response plan to be followed in the event of a failure of the bypass pumping system. The CONTRACTOR's plan shall include having a back up bypass pump on the construction site. The CONTRACTOR shall notify the ENGINEER 24 hours prior to commencing the bypass pumping operation. The CONTRACTOR's plan for sewage bypass pumping shall be for the main sewer and sewer service laterals and be satisfactory to the ENGINEER before the CONTRACTOR shall be allowed to commence sewage bypass pumping.

## 1.3 RELATED DOCUMENTS

- A. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 PRODUCTS

### 3.1 GENERAL

- A. Sizes of gravity sewer pipe to be used in all locations are indicated.

### 3.2 PIPE

- A. Polyvinyl Chloride (PVC) Pipe and Fittings:
1. 15-inch diameter PVC sewer pipe and under for general service shall conform to ASTM D3034, standard dimension ratio not to exceed 26.
  2. PVC fittings for 15-inch diameter pipe and under for general service shall conform to ASTM D3034, standard dimension rate not to exceed 35.
  3. PVC pipe for water mains 12 inches and smaller shall be AWWA C900, standard dimension. Ratio not to exceed 18.
  4. PVC additives and fillers including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

### 3.3 PIPE JOINTS

- A. Polyvinyl Chloride (PVC) Pipe Joints: Joints shall be rubber gasketed type complying in all respects to the physical requirements of ASTM D3212 for gravity sewers. Gaskets shall conform to ASTM F477. Furnish complete information on basic gasket polymer and results of tests of physical properties. Lubricant for jointing as approved by the pipe manufacturer. An adapter as recommended by the pipe manufacturer shall be used for connecting PVC pipe to manholes.
- B. Joints for Dissimilar Gravity Sewer Pipe: An approved flexible mechanical compression joint coupling with Type 316L stainless steel bands manufactured by Fernco Joint Sealer Co., of Ferndale, MI; or a PVC Bell by Bell adapter, manufactured by Harrington Corp., Lynchburg, VA, or equal.

3.4 WYE FITTINGS

- A. Joints on all wye fittings shall be the same as the joints used on the sewer pipe. Caps or plugs shall be furnished with each wye outlet or stub with the same type gasket and joint as furnished with the service connection pipe specified. The plug or cap shall be banded or otherwise secured to withstand all test pressures involved without leakage.
- B. Furnish all wye outlets with gasketed type joint or approved adapter to join service connection pipe used.
- C. Repair PVC couplings fittings shall be the same as the joints used on the sewer pipe

3.5 WATER MAIN FITTINGS AND RESTRAINTS

- A. Fittings for water mains shall be ductile iron mechanical joint. Fittings shall conform to AWWA C-153 and have a working pressure of 350 psi.
- B. PVC water main and pipe and ductile iron fittings shall be restrained with mega lugs as manufactured by Ebba Iron, Eastland, TX.

3.6 PIPE BEDDING AND PIPE ZONE MATERIAL

- A. Pipe bedding and pipe zone material shall be crushed gravel or crushed rock, free from dirt, clay balls and organic material and conforming to size No. 57 gradations as specified in the Standard Specifications and shall be imported at the CONTRACTOR's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock which has been crushed and graded to size as specified, will not be accepted for pipe bedding and pipe zone material.

3.7 FILTRATION GEOTEXTILE

- A. Geotextile shall be a pervious sheet of polyester, polyethylene, nylon, or polypropylene filaments, woven or nonwoven, and formed into a uniform pattern. The geotextile shall have the following minimum properties (except when a range is given) when measured in accordance with the referenced standard:

PHYSICALPROPERTY	TEST METHOD	REQUIREMENTS
Grab Tensile Strength lbs (minimum)	ASTM D4632	200
Elongation (%)	ASTM D4632	60
Apparent Opening Size U.S. Sieve No.	ASTM D4571	30 - 70
Permeability (cm/sec)	ASTM D4491	0.35
Trapezoid Tear Strength lbs (minimum)	ASTM 4533	75
Ultraviolet Degradation	ASTM D4355	80 percent strength

PHYSICALPROPERTY	TEST METHOD	REQUIREMENTS
(minimum)		retention after 500 hours

- B. The geotextile shall be finished so that the filaments will retain their relative position with respect to each other. The edges of woven fabric shall be finished to prevent the outer material from pulling away from the fabric.
- C. The CONTRACTOR shall provide manufacturer's certificate of compliance attesting that the geotextile meets the requirements of these Specifications. Provide mill certificates stating the length and width of fabric contained on each roll.

3.8 CLOSED CIRCUIT TELEVISION (CCTV) EQUIPMENT

- A. The CCTV camera shall be color and one specifically designed and constructed for such inspections. Lighting and camera quality shall be suitable to allow a clear, in-focus picture of a minimum of 6 linear feet of the entire inside periphery of the sewer pipe. The camera shall have a minimum resolution capability of 750 lines. The camera shall record in VHS format.
- B. Color television monitors shall be provided. Monitors shall have a resolution capability of no less than 650 lines. Continuously displayed on the monitors as part of the video presentation shall be the date of the survey, number designation of the manhole section being surveyed, and a continuous forward or reverse readout of the camera distance from the manhole of reference. Picture quality and definition shall be to the satisfaction of the OWNER's representative and if unsatisfactory, equipment shall be replaced at the CONTRACTOR's expense.

PART 3 EXECUTION

4.1 PREDIGGING AND RELOCATIONS OF WATER MAIN PREDIG

- A. The CONTRACTOR is responsible to relocate and protect water mains that are within the construction limits of sewers, manholes, laterals, and appurtenances. Water mains shown were located based on record drawings and general installation procedures. In certain instances it may be necessary to relocate the water main horizontally or vertically because the actual location is too close to a structure or conflicts with the new sewer main.
- B. At some locations the predigging of a water main is called out on the Drawings. However, some water mains may have to be relocated as a result of information gathered during the CONTRACTOR's excavation for the new sewers.
- C. In both instances, the CONTRACTOR is to expose the water main and provide the invert elevation and physical dimensions of the water main and adjacent structures to the ENGINEER. After review of the information, the ENGINEER will direct the CONTRACTOR how to proceed with the relocation.

- D. When the CONTRACTOR is directed to relocate the water main it shall be accomplished by installing four 45-degree bends, two solid sleeves, and approximately 30 feet of PVC pipe. The complete installation shall have all restrained joints including the connections to the existing pipe.
- E. The CONTRACTOR may request a predig and payment will be made only if the ENGINEER agrees that the situation justifies the need.
- F. In the instance where the CONTRACTOR does not predig, but the ENGINEER decides that the water main should be relocated, payment will be made only for the relocation.
- G. In the instance where the CONTRACTOR does the predig, but the actual information reveals to the ENGINEER that the water main should not be relocated, payment will be made only for the predigging.
- H. Water mains smaller than 2 inches in diameter shall be considered incidental to the installation of the new sewers and be relocated at the sole cost of the CONTRACTOR.

#### 4.2 BYPASS PUMPING

- A. The CONTRACTOR shall provide bypass pumping for acceptable completion of the pipe installation. Bypass pumping shall consist of furnishing, installing, and maintaining all power, primary and standby pumps, appurtenances and bypass piping required to maintain existing flows and services. The CONTRACTOR shall submit a plan for bypass pumping diversion in accordance with Paragraph SUBMITTALS, Item C, of this specification. The bypass pumping shall include an emergency response plan to be followed in the event of a failure of the bypass pumping system.
- B. Bypass pumping shall be done in such a manner as not to damage private or public property, or create a nuisance or public menace. The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic, and shall be redirected into a sanitary sewer system. Dumping or free flow of sewage on private property, gutters, streets, sidewalks, or into storm sewers is prohibited. The CONTRACTOR shall be liable for all cleanup, damages, and resultant fines in the event of a spill. After the work is completed, flow shall be returned to the replaced sewer and all temporary equipment removed.
- C. The CONTRACTOR shall take all necessary precautions to ensure that no private properties are subjected to a sewage backup or spill.
- D. The CONTRACTOR shall pump out or otherwise positively drain all locations, a minimum of once every 24 hours, where the sewer service is disconnected from the main sewer for more than one day. More frequent pumping shall be used in locations where wastewater flows exceed the capacity of temporary storage provided by the CONTRACTOR.

- E. The CONTRACTOR shall bypass or contain all sewer service lateral connections from the time of disconnection to the time of reconnection by means of mechanical pumps and manifold system or by a bladder tank system, capable of holding adequate sewage from each sewer service connection for a period of 24 hours. Each bladder shall be emptied or pumped each 24-hour period and properly disposed of in accordance to the specification.
- F. When pumping is in operation, all engines shall be equipped in a manner to keep the pump noise to a minimum and shall comply with the City of Key West Noise Ordinance.

#### 4.3 PREPARATION OF TRENCH

- A. Pipe Bedding Material:
  - 1. Grade: Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for pipe bedding. Before laying each section of the pipe, check the grade and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe between bell holes.
  - 2. Granular Material for Pipe Bedding: Provide granular material for pipe bedding under all pipe. Place material in the trench to a minimum depth of 6 inches and to a level 1/2 of the outside diameter above the bottom of the pipe barrel. Particular attention must be given to the area from the flow line to the centerline of the pipe to ensure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone. Grade the top of the bedding to the bottom of the pipe ahead of pipe laying for the full width of the trench. Bedding shall provide firm support along entire pipe length.
  - 3. Bell (Joint Holes): At the location of each joint, dig bell joint holes of ample dimensions in the bedding and at the sides where necessary to permit the joint to be made properly and to permit easy visual inspection of the entire joint.

#### 4.4 PIPE DISTRIBUTION

- A. Distribute material on the job no faster than it can be used to good advantage. In general, distribute no more than 1 day's supply of material in advance of the laying, unless otherwise accepted by the ENGINEER. Unload pipe which cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. Do not drop pipe of any size from the bed of the truck to the ground.

#### 4.5 PIPE PREPARATION AND HANDLING

- A. Inspect all pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

- B. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

#### 4.6 LINE AND GRADE

- A. Gravity Pipe:
  - 1. Do not deviate from line or grade, as established by the ENGINEER, more than 1/2 inch for line and 1/4 inch for grade, provided that such variation does not result in a level or reverse sloping invert.
  - 2. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.
  - 3. All repair of gravity sewer pipe shall be laid using a laser. The beam shall be directed through the pipe. Batterboards or instrument laying will not be permitted. The laser shall be constantly shielded from the direct sun.
  - 4. The CONTRACTOR shall set offset stakes or other accepted method of controlling alignment and grade for excavation of trenches and for pipe laying.
- B. The CONTRACTOR shall be responsible for any damage to properties or buildings connected to the sewer system, and to the pipeline, which result from flow control activities.

#### 4.7 CONNECTIONS TO DISSIMILAR GRAVITY SEWER PIPE

- A. Make connections with flexible mechanical joint couplings in accordance with the Detailed Drawings and the recommendations of the manufacturer. Use only when approved by the ENGINEER, and then only to make connections between dissimilar pipe or where standard rubber gasketed joints are impractical. Before the closure collar is poured, wash pipe to remove all loose material and soil from the surface on which the concrete will be placed. Wet nonmetallic pipe thoroughly prior to pouring the collars. Make entire collar in one pour and extend a minimum of 12 inches on each side of the joint. The minimum thickness around the outside diameter of the pipe shall be 6 inches. No collar shall be poured in water. After the collars are poured and have taken their initial set, cure by covering with well-moistened earth.
- B. All private property laterals that are PVC shall be reconnected to the city sewer with PVC fittings.

#### 4.8 LAYING AND JOINTING PIPE AND FITTINGS

- A. Sewer Pipe:
  - 1. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance

with the recommendations of the manufacturer of the type of joint used.

Provide all special tools and appliances required for the jointing assembly.

2. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed. Pipe 21 inches and smaller shall be laid so the inside joint space does not exceed 3/8 inch in width.
3. When pipe is laid within a movable trench shield, take all necessary precautions to prevent pipe joints from pulling apart when moving the shield ahead.
4. Take the necessary precautions required to prevent excavated or other foreign material from getting into the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.
5. Plug or close off pipes which are stubbed off for manhole construction or for connection by others, with temporary plugs as specified in the manhole specifications.
6. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
7. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer and approved by the ENGINEER.

#### 4.9 INSTALLATION OF SERVICE CONNECTION WYES

- A. Install wye fittings in accordance with the Sewer Service Connection Detailed on the Drawings. Provide all wyes with caps or plugs, as specified. Provide a minimum 2-foot wide concrete encasement around wyes installed in trenches deeper than 12 feet.

#### 4.10 BACKFILL AT THE PIPE ZONE

- A. The pipe zone shall be considered to include the full width of the excavated trench from the centerline of the pipe to a point 12 inches above the top outside surface of the barrel of the pipe or to elevation +2.5 NGVD, whichever is higher.
- B. Pipe zone material as hereinbefore specified shall be used for the full depth of the pipe zone and for the full width of the excavated trench for all pipe.
- C. Hand place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "walking in" and slicing with a

shovel. Backfill the area of the pipe zone from the horizontal centerline to a point 12 inches above the top outside surface of the barrel of the pipe or to elevation +2.5 NGVD, whichever is higher, with selected material for pipe zone. Use particular attention in placing material on the underside of the pipe to provide a solid backing and to prevent lateral movement during the final backfilling procedure.

- D. Conform to Section 312300, EXCAVATION AND FILL.
- E. Backfill at the pipe zone for sewer pipe must receive particular attention and care to prevent damage to the pipe. Deflection of pipe shall be kept to a minimum and in no case shall it exceed 5 percent of the pipe inside diameter.

#### 4.11 PLACEMENT OF FILTRATION GEOTEXTILE

- A. The CONTRACTOR shall line the trench with filtration geotextile material.
- B. For placement within the pipe zone, place backfill in 6-inch lifts and compact each lift to 90 percent relative compaction.
- C. For placement of backfill above filtration geotextile, place the first lift of fill above in 12-inch lifts to protect the geotextile material. Place additional granular fill in 6-inch lifts and compact each lift to 90 percent relative compaction.
- D. The CONTRACTOR shall take precautions so the operation will not damage the geotextile material.

#### 4.12 REMOVAL OF EXISTING LINES

- A. The CONTRACTOR shall furnish all labor, materials, and equipment required for the removal and disposal of existing sewerlines including manholes which are to be replaced by new construction utilizing the same trench. The existing lines and manholes to be removed are not considered worthy of salvage and therefore will be broken up and disposed of at the nearest legally operated landfill.

#### 4.13 MATERIALS TESTS AND INSPECTIONS

- A. PVC Pipe:
  - 1. PVC pipe shall be inspected at the point of manufacture in accordance with the manufacturer's standard methods. Unless otherwise directed by the ENGINEER, provide a certificate of tests in lieu of witnessing the inspection and test procedures.
  - 2. Pipe and accessories that are chipped, cracked, or contain other imperfections, or do not satisfactorily meet the manufacturer's standard test requirements shall be rejected.
- B. PVC Deflection Test: All PVC gravity sewerlines shall be tested for deflection after installation and backfill by pulling a round plug equal to 95.0 percent of pipe base

inside diameter, as defined in the Appendices of ASTM D3034, through the completed pipeline. The mandrel shall be of a design that provides an accurate measure of excess deflection regardless of orientation. Mandrel testing shall be performed not less than 30 days after complete pipe installation.

- C. Television Inspection for Acceptance Testing of All New Sewer Pipe:
1. Plug off manhole at ends of line so no flow enters new sewer pipe except that from the service connections. Clean and inspect the sewer pipe that has been installed as specified in Article FINAL CLEANING AND CCTV INSPECTION. Replace any sewer pipe which has leaky joints as specified in this section. Grouting of leaky joints on new sewer pipe will not be accepted. Reinspect the replaced pipe for leaky joints and replace sewer pipe until no leaky joints exist.
  2. All television inspection for acceptance shall be performed at periods of high tide; those periods when the groundwater table is the highest and shall be performed only during the 6-hour period of highest tide. In addition, television inspection shall only be performed during the highest tide period each day.
- D. To successfully pass the deflection and TV inspections the following shall be demonstrated:
1. No visible leaks.
  2. Deflection of pipe shall not exceed 5 percent.
  3. All pipe joints shall be aligned and none displaced.
  4. Grade and alignment shall be continuous without sags or curvature from manhole-to-manhole.

#### 4.14 FINAL CLEANING AND CCTV INSPECTION

- A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the ENGINEER, flush and clean all parts of the gravity system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.
- B. The following general procedure shall be followed to pressure clean and televise the sewer pipes. The work shall be accomplished completely in one manhole section at a time. A manhole section is defined as the length of pipe connecting two manholes.
1. High pressure clean a manhole section.
  2. Inspect the manhole section internally with TV within 3 days of cleaning, and make a log of conditions encountered.
  3. Simultaneous with the TV inspection make a video tape recording of each manhole section.
  4. Take Polaroid photos of the monitor image as required by the ENGINEER.

4.15 WASTEWATER FLOW CONTROL

- A. Wastewater flows shall not exceed the limits shown below for the respective line sizes as measured in the manholes when performing CCTV inspection:

Pipe Size	Maximum Depth Flow
6 - 12 inches	25 Percent of Pipe Diameter
15 - 24 inches	30 Percent of Pipe Diameter
Greater than 24 inches	35 Percent of Pipe Diameter

- B. When wastewater flows are too high or inspection of the complete periphery of the pipe is necessary to effectively conduct the television inspection, wastewater flows shall be controlled through the pipeline segment where the work is being performed. Plugging, bypassing, pumping, and other measures may be used as needed and as approved by the ENGINEER. The CONTRACTOR shall be responsible to assess existing conditions and capacities of existing sewer lines and pump stations in order to implement an acceptable bypass plan at no additional cost to the OWNER. If pumping is required, the CONTRACTOR shall supply the necessary pumps, conduits, and other equipment to not only divert the flow of sewage around the manhole section in which work is to be performed but also to transmit the flow in downstream sewer line and/or pump stations without surcharge. The bypass system or systems shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of high tide or rain storms. The CONTRACTOR shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. All engines shall be equipped in a manner to keep the pump noise to a minimum.
- C. The CONTRACTOR shall be responsible for any damage to properties or buildings connected to the sewer system, and to the pipeline, which result from flow control activities.

END OF SECTION 333113

## SECTION 333913 – PRECAST SANITARY MANHOLES

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Work necessary for construction of manholes, manhole liner, manhole repair, plugging abandoned sewers, and miscellaneous concrete, complete. Manhole details are as shown on Drawings.
- B. The CONTRACTOR shall verify all existing manholes and incoming and outgoing sewer diameters and invert elevations prior to ordering new manholes.

## 1.2 SUBMITTALS

- A. The CONTRACTOR shall submit for review a detailed CAD drawing for each type of structure used on the project. These drawings shall detail the precast structure, per the designs specified for the project, and shall show the concrete protective liner's placement on interior surfaces, across joints, at pipe connections, and at the adjustment area between manhole and casting.
- B. The CONTRACTOR shall provide a detailed description of all liner field welding and weld testing procedures and will supply to the ENGINEER a copy of the liner manufacturer's certification of training for those personnel performing the field welding. In addition, upon completion of the field welding and testing, a copy of the welding contractor's inspection and testing log that lists, per structure, the dates of inspection and testing shall be provided to the ENGINEER. This log will be accompanied by a notarized certification from the welding contractor that states that the welding, inspection, and testing was conducted per the liner manufacturer's specifications.

## 1.3 SHOP DRAWINGS

- A. Precast Manholes: Details of construction.
- B. Precast Base Sections: Details of construction.
- C. Manholes Over Existing Sewers: Plans and schedule for diverting sewage flow.

## 1.4 QUALITY CONTROL SUBMITTALS

- A. Precast Manhole Sections: Manufacturer's results of tests performed on representative sections to be furnished.
- B. Manufacturer's certification of liner system.

**PART 2 PRODUCTS**

## 2.1 BASE ROCK

- A. Base rock shall be crushed gravel or crushed rock, free from dirt, clay balls and organic material and conforming to size No. 57 gradation as specified in the Standard Specifications or similar accepted material and shall be imported if necessary at the CONTRACTOR's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock which has been crushed and graded to size as specified, will not be accepted for base rock.

## 2.2 CONCRETE

- A. Ready-mixed, meeting ASTM C94, Alternate 2, and the following:
  - 1. Manhole Base Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Maximum Aggregate Size: 1-1/2 inches.
  - 3. Slump: 2 to 4 inches.

## 2.3 MORTAR

- A. Standard premixed meeting ASTM C387, or proportion 1 part portland cement to 2 parts clean, well-graded sand which will pass a 1/8-inch screen.
- B. Admixtures: May be included but do not exceed the following percentages of weight of cement:
  - 1. Hydrated Lime: 10 percent.
  - 2. Diatomaceous Earth or Other Inert Material: 5 percent.
- C. Consistency:
  - 1. Tongue-and-Groove Type Joint: Such that mortar will readily adhere to pipe.
- D. Mortar mixed for longer than 30 minutes shall not be used.

## 2.4 FORMS

- A. Exterior exposed surfaces shall be plywood. Others shall be matched boards, plywood, or other approved material. Form all vertical surfaces. Trench walls, large rock, or earth will not be approved form material. Forms shall be so designed and constructed that they may be removed without injury to the concrete. Forms shall be approved by the ENGINEER before being filled with concrete.

## 2.5 REINFORCING BARS

- A. Deformed bars as specified hereinbefore and, in addition, conforming to ASTM A775, except as otherwise specified herein, for all reinforcing steel, regardless of whether the steel is used in precast units or cast in place units.

## 2.6 BRICK MANHOLES

- A. Brick manholes may be used for conflict manholes provided all details of construction are approved by the ENGINEER.

## 2.7 BRICKWORK

- A. Brick: ASTM C32, common, hard buried clay, regular and uniform in shape and size and of compact texture, Grade MA.
- B. Cement: ASTM C150, portland cement Type II.
- C. Sand: ASTM C144, except that not less than 5 percent shall pass the No. 100 sieve, washed silica sand.
- D. Lime: Lime putty shall be made from Type S hydrated lime and shall conform to ASTM C207. Lime shall be kept dry until used.
- E. Mortar:
  - 1. Conform to ASTM C270, Type S. Mortar shall consist of one part portland cement, from 1/4 to 1/2 part lime putty, or hydrated lime, and clean well-graded sand in the proportion of three times the sum of the cementitious material.
  - 2. Mortar shall be mixed in a batch mixer for not less than 5 minutes, and shall be mixed long enough for thorough intimate mixing of all ingredients. If color is added, it shall be added in a consistent manner to provide final uniformity.

## 2.8 EXTERIOR COATING

- A. Exterior coating shall be coal-tar epoxy, Koppers 300-M, or equal. Minimum 16 mils dry film thickness, in two equal applications. First coat shall be red and second coat shall be black.

## 2.9 PRECAST MANHOLE SECTIONS

- A. Precast manhole sections shall be minimum 48 inches in diameter, conforming to ASTM C478. Precast sections shall meet the permeability test requirements of ASTM C14. Minimum wall thickness shall be 6 inches. All manholes of less than 5 feet of depth shall have flat top covers. Manholes deeper than 5 feet of depth shall be concentric cones. Cones shall have same wall thickness and reinforcement as manhole section. Top and bottom of all sections shall be parallel. The CONTRACTOR's attention is directed to Paragraph MORTAR hereinbefore.

## 2.10 PRECAST BASE SECTIONS AND BASES

- A. Precast Base Sections or manhole bases shall be provided and shall conform to all details of construction approved by the ENGINEER. Base sections shall have the base slab integral with sidewalls. Base slab shall be 8 inches thick up to 6 feet deep and 10 inches thick for slabs greater than 6 feet deep with No. 4 reinforcing bars, 8-inch centers, both directions in center of slab. Tie reinforcing steel to wall steel.

2.11 PROTECTIVE LINER FOR PRECAST CONCRETE

- A. Polypropylene:

1. Physical Properties:

- a. The polypropylene (PP-R) liner shall be free of pores, pinholes, voids, and foreign bodies. All anchoring studs shall be manufactured during the extrusion process in one piece with the sheet. No welding to attach the studs to the sheet or mechanical finishing work is permitted. Additionally, all welding rod, profile strips, cap strips, and polyester backed pipe wrapping shall be manufactured from the same resins by the same manufacturer.
- b. The characteristics values of the raw materials shall be as follows:

<u>Property</u>	<u>Test Method</u>	<u>Unit</u>	<u>Std. Value</u>
Density	ASTM D792-86	g/cm <sup>3</sup>	0.898
Melt Flow Index	ASTM D1238-88	g/10 min	(190/5)
Heat Reversion	ASTM D1637-83	%	<2
Yield Stress	ASTM D638-89	N/mm <sup>2</sup>	≥ 2,900
Elongation of Yield	ASTM D638-89	%	≥10
Elongation at Break	ASTM D638-89	%	≥ 50
Fire Classification	UL94		V2
Electric Conductivity			10 <sup>13</sup>
Max. Working Temp.		F.	194 Degrees F
Resistance to Pullout	SKZ Test Directives	T/m <sup>2</sup> T/ft <sup>2</sup>	30 3

2. Design:

- a. Studded liner sheets shall have a minimum design thickness of 2 mm (0.079 inch) and shall have a minimum of 39 anchoring studs per square foot of liner. Minimum stud height shall be no less than 9 mm (0.39 inch) with a minimum length of 14 mm (0.55 inch). Anchoring studs must be capable of resisting continuous hydraulic backpressure, to a minimum of 40 feet of hydraulic head, exerted between the interior wall of the concrete structure and the anchoring stud side of the protective liner.

- b. Nonstudded polypropylene cap strips used to bridge construction joints shall have a minimum design thickness of 3 mm (0.118 inch). Polyester backed nonstudded polypropylene sheets, used for the purpose of bonding the liner to dissimilar materials, shall be attached to the polypropylene sheet during the extrusion process.
  - c. The lining system shall be designed to be repairable at any time during the life of system.
  - d. Polypropylene liner shall be designed and installed to protect the precast structure's interior floor, wall, cone, underside of top slab, and manhole casting adjustment area from chemical attack and microbial corrosion and to hydrostatically seal the entire interior to prevent groundwater infiltration. A seal between the ring and cover and the liner must be incorporated into the design.
3. Manufacturers: Sure-Grip; U.S. Precast, Cape Coral, FL.

B. Fiberglass:

- 1. General Dimensions:
  - a. All preformed fiberglass liner units shall be proportioned for compatibility with the specified precast concrete units including base liners, riser liners, and cone liners. The terminal edges of the liners shall extend no less than 3/4 of an inch into the joint.
  - b. The depth of the main through channel shall be equal or greater than the diameter of the main pipe run. The depth of each lateral channel shall be equal to or greater than the diameter of the lateral pipe.
- 2. Physical Properties:
  - a. The fiberglass liner shall be constructed from fiberglass reinforced polyurethane, minimum thickness 3/16-inch, meeting the following composition requirements and incorporating the area and point bonding system.
  - b. Fiberglass:
    - 1) Minimum length of fiber: 0.625 inch.
    - 2) Glass content between 12 percent and 15 percent by weight.
    - 3) Fiberglass weight between 400 and 425 linear yards per pound.
    - 4) Fiberglass type to be E glass.
  - c. Chemical Resistance:
    - 1) There shall be no surface degradation of the fiberglass liner when tested according to ASTM D1308 using the following reagents at 16-hour exposure:
      - a) Nitric Acid: 69 percent.
      - b) Hydrochloric Acid: 38 percent.
      - c) Acetic Acid: 60 percent.
      - d) Ammonia: 28 percent.
      - e) Sodium Hydroxide: 5.25 percent.
      - f) Sulfuric Acid: 50 percent.
      - g) Acetone.
      - h) Unleaded gasoline.

- i) Turpentine.
  - 2) There shall be no evidence of chemical attack on the material when tested according to ASTM D2152.
- d. Thermal Shock: There shall be no evidence of surface defects after testing the fiberglass liner material in accordance with CSA-B45-M93 Clauses 5.2.2.1 to 5.2.2.4.
- e. Friction Coefficient: The channels shall have a smooth, nonporous surface with a Manning Friction Coefficient no higher than 0.009.
- 3. Area and Point Bonding System:
  - a. Bonding Aggregate: Bonding aggregate shall be prewashed, kiln-dried, fractured 3/8-inch gravel having a well graded particle size distribution complying with the table below with minimum size = 3/16 inch and maximum size = 3/8 inch. Rate of application is 3.5 lb/square foot. Aggregate is to be applied uniformly with sufficient exposed surface area to ensure a complete and homogeneous bonding with the fiberglass polyurethane, as well as the concrete during the precast process.
  - b. Particle Size Distribution (ASTM E-11):

Sieve No.	% Passing
0.375	100
0.25	100
4	98-100
6	50-80
8	5-15
16	0-2

- c. Bonding Wire: Bonding wire shall be grade 1006 10-gauge cold drawn wire having a tensile strength of 75,000 psi, formed into coils of 2-inch diameter. The steel shall comply with ASTM A510 and ASTM A853.
- 4. Connection to Socket Geometry: The geometry of each socket on a fiberglass liner shall meet ASTM F789 and ASTM D3034 for the PVC pipe to be connected.
- 5. A seal between the ring and cover and the liner must be incorporated into the design.
- 6. Fiberglass liner shall be as manufactured by GU Florida, Inc., Sarasota, FL.

2.12 PRECAST OR LINED MANHOLE BENCH AND INVERT SYSTEMS

- A. Precast bench and invert system used with polypropylene liner shall be cast with 4,000 psi concrete at 28 days with type II cement and 100 percent calcareous (limestone) aggregates. Precast bench and invert system shall be a factory built

solid concrete system. Invert and flow channels shall be formed and constructed with a system that is engineered for this application. Precast bench and invert system shall be Tru-Contour Invert System as manufactured by A-LOK products, Inc., Tullytown, PA.

- B. Lined bench and invert system used with fiberglass liner shall be solid fiberglass of the same thickness and properties of the liner system. Fiberglass lined system shall be as manufactured by GU FLORIDA, Sarasota, FL.

## 2.13 GASKETS AND SEALANTS

- A. Preformed plastic gaskets for polypropylene lined manhole joints shall be RAM-NEK, Henry Co., Houston, Texas; or equal, meeting all requirements of Federal Specification SS-S-00210.
- B. Preformed rubber gaskets for fiberglass lined manholes shall be Rub'R Nek Ltm; Henry Co., Houston, TX, or equal, meeting Federal Specification SS-S-210A.
- C. Gaskets for joining pipes to the manhole fiberglass base liner shall be as approved by the pipe manufacturer, shall conform to the current ASTM C443 or ASTM 923 standard, and shall be installed according to the manufacturers' instructions.
- D. Resilient connectors for connections to 10-inch sewer pipes to polypropylene lined manhole with precast bench and invert system shall be rubber that is manufactured from synthetic compounds formulated for wastewater applications. The gasket shall comply with the physical requirements prescribed by ASTM C923 when tested in accordance with the referenced ASTM. Gaskets shall be A-LOK as manufactured by A-LOK Products, Inc., Tullytown, PA or approved equal.
- E. Caulking:
  - 1. Caulking to be applied to the inside of the fiberglass manhole riser shall meet the following:
    - a. No reaction with FRP.
    - b. Insoluble in water.
    - c. Has good long-term adhesion and cohesion.
    - d. Does not crack, shrink, or unstick.
    - e. Remains stable in a wastewater collection environment.
    - f. Resistant to H<sub>2</sub>S.
    - g. Does not stain.
    - h. Caulk for new chimneys seals shall be 5100 Marine Caulk.
- F. Sealants (Water-Stop):
  - 1. A sealing compound shall be applied to the outside area around each bell of the fiberglass base liner. The sealant shall be applied in one coat extending from the bell opening for a continuous 3-inch wide band around

the entire bell. Apply the sealant between 15 minutes and 3 hours before pouring the concrete around the fiberglass base liner.

2. The sealant may be Tapecoat Mastik Compound as supplied by the Tapecoat Company, or approved equivalent. The sealant is to be applied in accordance with the manufacturer's recommendations.

#### 2.14 EXTERNAL JOINT WRAP

- A. External joint wrap shall be EZ-WRAP plastic as manufactured by Press-Seal Gasket Corporation, Fort Wayne, IN, or equal.

#### 2.15 PIPE STUBOUTS FOR SEWER CONNECTIONS

- A. Pipe stubouts where connecting directly into the manhole shall be the same type as approved for use in lateral, main, or trunk sewer construction. Strength classifications shall be same class as in adjacent trenches. Where there are two different classes of pipe at a manhole, the higher strength pipe will govern strength classification.

#### 2.16 MANHOLE FRAMES AND COVERS

- A. Cast iron of size and shape detailed on the Drawings. Covers shall have the word SANITARY SEWER, as appropriate, in 2-inch raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points.

#### 2.17 NONSHRINK GROUT

- A. Manufacturer:
  1. UPCO Co., Cleveland, OH, Upcon High Flow.
  2. Master Builder Co., Cleveland, OH, Master Flow 713.
  3. L & M Construction Chemicals, Inc., Omaha, NE, Crystex.

#### 2.18 MANHOLE EXTENSIONS

- A. Concrete grade rings for extensions shall be a maximum of 6 inches high and shall be approved by ENGINEER before installation. In general, manhole extensions will be used on all manholes in roads or streets or in other locations where a subsequent change in existing grade may be likely. Extensions will be limited to a maximum height of 12 inches. Finish grade for manhole covers shall conform to finished ground or street surface unless otherwise directed by the ENGINEER. The CONTRACTOR will be responsible for coordinating with the ENGINEER and OWNER to determine the finish grade for manhole covers and will make all adjustments necessary to bring manhole covers to that grade. Extensions shall be lined with polypropylene and be watertight.

## 2.19 MANHOLE CONNECTION SLEEVE

- A. Manhole connection sleeve shall be a molded connector with an A-Lok gasket centered and integral to the sleeve. Gasket shall be the nominal size of the sewer pipe with sufficient tolerance to compress the gasket that will prevent leakage along the gasket to pipe interface. Manhole connection sleeve shall be as manufactured by A-Lok Products, Inc., Tullytown, PA.

## PART 3 EXECUTION

## 3.1 EXCAVATION AND BACKFILL

- A. As specified in Section 312300, EXCAVATION AND FILL.
- B. Backfill Around Manholes: Use highest class of trench backfill immediately adjacent, as shown on the Drawings.

## 3.2 BASE ROCK

- A. Remove water from the excavation.
- B. Place minimum of 6 inches of rock base in conformance with Section 911 of the FDOT Standard Specifications for Road and Bridge Construction and thoroughly compact with a mechanical vibrating or power tamper.

## 3.3 EXTERIOR COATING

- A. Precast concrete manholes shall be coated outside with two coats of specified coating. The CONTRACTOR is to repair any damage to the coatings in accordance with the coating manufacturer's recommendations.

## 3.4 PRECAST CONCRETE BASE

- A. Construct concrete base in conformance with Paragraph PRECAST BASE SECTIONS AND BASES, and the details shown on the Drawings.
- B. Precast base shall be set and leveled at its proper location before closure of that run of pipe is made. Precast manhole shall not be moved or set into the new sewer pipe spigot end.
- C. After base installation, grout the gap in the manhole between the stubout pipe invert and the precast channel with nonshrink grout.

## 3.5 LINING SYSTEMS

- A. The installation of concrete protective liner shall be accomplished only by a factory certified precast manhole manufacturer with a minimum of 5 years of precast manhole and lift station manufacturing experience and a minimum of 5 years' experience in the installation of corrosion resistant liners in concrete

structures. Upon request, the liner installer shall provide written certification that the installation is in accordance with the liner manufacturer's specifications.

- B. Placement of the liner on forms shall conform to the liner manufacturer's written instructions and all shop welding shall be performed by welders certified by the liner manufacturer.

### 3.6 PLACING PRECAST MANHOLE SECTIONS

- A. Preformed Plastic Gaskets: Install in accordance with manufacturer's instructions and the following:
  - 1. Carefully inspect precast manhole sections to be joined.
  - 2. Do not use sections with chips or cracks in the tongue.
  - 3. Use only pipe primer furnished by gasket manufacturer.
  - 4. Install gasket material in accordance with manufacturer's instructions.
  - 5. Fusion weld top and bottom 2-inch minimum wide strip over each section joint, where required.
  - 6. Completed Manholes: Rigid and watertight.

### 3.7 GRADE ADJUSTMENTS

- A. Construct brick masonry on top of manhole or precast concrete manhole grade rings cones to provide grade adjustment in setting manhole frames.

### 3.8 BRICKWORK

- A. All brick shall be saturated with water before being laid. Set true to line with courses plumb. Use no mortar that has begun to set.
- B. Coursing: For gravity sewers lay bricks radially as headers with every sixth course laid as stretchers. The sides of each brick shall be buttered and shoved (not laid) in a full bed of mortar.
- C. Joints: Horizontal joints shall not be greater than 1/2-inch thick. Fill longitudinal and transverse joints completely in each course before starting the next course. Joints shall be struck flush.
- D. Parge Coat: The interior and exterior of the manhole shall be plastered with 1/2-inch thick coat of mortar to leave a dense smooth finish, completely watertight.

### 3.9 SETTING MANHOLE FRAMES

- A. Set manhole frames and covers to conform accurately to the finished ground or pavement as shown or as directed by the ENGINEER. Set frames on manholes concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame will be completely filled and made watertight. Place a ring of mortar around the outside

of the bottom flange at least 1-inch thick and pitched to shed water away from the frame. Extend mortar to the outer edge of the masonry and finish smooth and flush with the top of the flange.

### 3.10 PRECAST OR LINED MANHOLE BENCH AND INVERT SYSTEMS

- A. Construct manhole inverts in conformance with details shown on the Drawings, and to the verified elevations as required.
- B. Precast and bench and invert systems shall be constructed in strict conformance with the respective manufacturer's procedures and recommendations.

### 3.11 DROP MANHOLE ASSEMBLIES

- A. Construct drop manhole assemblies at locations required by the ENGINEER and in accordance with the Detailed Drawings. The tee, vertical pipe, and the lower elbow shall be encased in concrete as shown on the Detailed Drawings.

### 3.12 FLEXIBLE JOINTS

- A. Provide joints in sewers not more than 1-1/2 feet from manhole walls. Lay pipes entering manholes on firmly compacted base rock to undisturbed earth. Base rock shall be as specified hereinbefore.
- B. Where connection to dissimilar pipe material is made or where connections to existing manholes are made, install one full length of pipe away from stout before installing concrete encased flexible coupling in accordance with the Drawings.

### 3.13 MANHOLE EXTENSIONS

- A. Install extensions in conformance with the details shown on the Drawings, and to height determined by ENGINEER. Lay grade rings in mortar with sides plumb and tops level. Seal joints as specified for manhole sections. Extensions shall be lined and watertight.

### 3.14 MANHOLE FRAMES AND COVERS

- A. Install frames and covers on top of manholes to positively prevent all infiltration of surface or groundwater into manholes. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown in the Manhole Details on the Drawings. Set frames so tops of covers are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

### 3.15 CONNECTION TO EXISTING MANHOLES

- A. Connect sewers to existing manholes at locations required. Provide all diversion facilities and perform all work necessary to maintain sewage flow in existing sewers during connection to the manholes. Connection is to be made to existing

pipe stubouts. The CONTRACTOR shall predig each stub-out to verify pipe materials and invert elevation prior to placing new sewer main.

3.16 CONFLICT MANHOLES

- A. Construct conflict manholes in conformance with applicable parts of these Specifications and as shown on the Drawings.

3.17 REMOVAL AND ABANDONMENT OF EXISTING MANHOLES

- A. When an existing manhole is removed, the CONTRACTOR shall remove and properly dispose of all sections, base slab, and old sewage pipe. The frame and cover shall remain as the property of the City and delivered to a site designated by the City.
- B. Abandonment of existing manholes shall be accomplished by removing and disposing of the top section to a minimum of 4 feet below grade, plugging pipe connections with nonshrink grout, backfilling and compacting the remainder of the manhole and with FDOT No. 57 fill.
- C. All material removed shall be satisfactorily disposed of by the CONTRACTOR at his expense.

3.18 ADJUSTING EXISTING MANHOLES

- A. Install extensions to finished grade. Lay grade rings in mortar with sides plumb and tops level. Seal joints with mortar as specified for manhole sections. Extensions shall be watertight.

3.19 PLUGGING ABANDONED SEWERS

- A. Plug abandoned sewers at each end of sewers that are to be abandoned or grouted and abandoned. Plug shall consist of two full rows of brick with nonshrink grout placed between all faces of the brick and any voids. The brick shall be set back in the pipe to accommodate a minimum 4-inch thick nonshrink grout plug at the pipe end.

3.20 TESTING

- A. Hydrostatic Testing:
  - 1. When, in ENGINEER's opinion, the groundwater table is too low to permit visual detection of leaks, hydrostatically test all project manholes.
  - 2. Procedure: Plug inlets and outlets and fill manhole with water to height determined by ENGINEER. Bypass pump sewage as required.
  - 3. Where practical, a manhole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place.
  - 4. Leakage in each manhole shall not exceed 0.1 gallon per hour per foot of head above the invert.

5. Repair manholes that do not meet the leakage test, or do not meet specified requirements for visual inspection.

END OF SECTION 333913

## SECTION 333923 - SANITARY SERVICE CONNECTIONS

## 1 PART 1 GENERAL

## 1.1 WORK INCLUDED

- A. This section covers the work necessary for the repairs and installation of the service connections for all pipe materials specified, complete.
- B. It shall be the CONTRACTOR's responsibility to properly locate and install all sewer service laterals.
- C. New service connections for existing wyes shall be extended to the street or alley right-of-way line, in which case a cleanout shall be furnished and installed. Sewer service connection details are as shown on the Drawings. Where a new service exists and where approved by the ENGINEER, the service connection may be made at the wall of the trench excavation for the main and connected directly with the existing service.

## 1.2 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## 2 PART 2 PRODUCTS

## 2.1 EXCAVATION AND BACKFILL

- A. Conform to Section 312300, EXCAVATION AND FILL.

## 2.2 PIPE AND FITTINGS FOR SERVICE CONNECTIONS

- A. General:
  - 1. Manufactured with nominal inside diameter of 6 inches. Except by permission of the ENGINEER, long-radius bends shall be used at all changes in direction. Pipe and fittings for individual service connections shall be of one type of material throughout, and no interchanging of pipe

and fittings will be allowed. Pipe and fittings shall be one of those specified below.

2. Minimum service size shall be 6 inches. The ENGINEER will determine the size of the service in every case, unless specifically shown.

B. PVC service connection lateral pipe and fittings shall conform to ASTM 3034, standard dimension ratio (SDR) of 26 and 35, respectively. (All repairs shall be made with PVC couplings)

### 2.3 DETECTION TAPE

A. Detection tape shall be 3 inches wide with a metallic backing. The tape shall be imprinted with the words CAUTION SEWERLINE BELOW. Tape shall be green "Terra Tape/D" as manufactured by Griffolyn Company, Inc., Houston, Texas; "Line Guard" by Calpico, South San Francisco, California; or equal.

### 2.4 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Pipe bedding and pipe zone material shall be as specified in Section 312300, EXCAVATION AND FILL.

### 2.5 SERVICE CONNECTION TO SEWER MAIN

A. Sewer service connection to 15-inch diameter or smaller PVC main shall be made with an inline PVC wye. PVC wye shall be sized for the pipe diameter by 6 inches for service lateral.

### 2.6 CLEANOUT BOXES AND COVERS

A. The cleanout boxes shall be a modified polyethylene meter box having a minimum wall thickness of 0.550 inch with wall core interior area of rigid foam construction offering insulation and tensile strength. Vertical crush to exceed 2,000 pounds, sidewall loading to exceed 180 pounds per square inch, and a compartment size of 11 by 18 by 26 inches deep. Cleanout boxes shall be protected from UV degradation with black exterior and white interior. A flange shall encircle the top area for installation in concrete. Provide knockouts or notches in each end sized to allow placement of a 6-inch PVC pipe inside the box.

B. Cleanout boxes shall be capable of being stacked vertically to provide adequate access to deeply buried sewer service lines.

C. Cleanout covers shall be cast ductile iron conforming to ASTM A-536, Grade 60-40-18. Meter box covers shall meet or exceed Federal Specification RR-F-621D for a minimum proof load of 25,000 pounds on a 9-inch by 9-inch area. Mark cover shall have raised lettering "Sewer Cleanout." All meter box

covers shall have a 10-year warranty. Cleanout box and cover shall be as manufactured by Mid-States Plastics, Mount Sterling, KY; or equal.

- D. All new clean out boxes not in existing concrete, shall be installed with a concrete pad as per the details.

## PART 3 EXECUTION

### 2.1 MAINTAIN EXISTING SERVICE

- A. The CONTRACTOR is responsible for maintaining sewage flows from the upstream lines leading to the pipe undergoing replacement by whatever means possible including, but not limited to, bypass pumping. At no time shall the CONTRACTOR be allowed to back up sewage flow to a potentially harmful level or to discharge sewage into the trench.
- B. The CONTRACTOR shall make whatever provisions are necessary to maintain house or building sewer service including, but not limited to, bypass pumping. During the time of disconnection and reconnection of service connections, the property owners or residents shall be notified prior to the work.

### 2.2 PIPE BEDDING MATERIAL

- A. Provide a minimum 6-inch thick base of pipe bedding material under all service connection pipe. Hand-grade bedding to proper grade ahead of pipe laying. The bedding shall provide a firm, unyielding support along the entire pipe length.

### 2.3 BACKFILL AT THE PIPE ZONE

- A. The pipe zone shall be considered to extend from the top of the pipe base to 12 inches above the top of the pipe and for the full width of the trench. Backfill the pipe zone with pipe zone material, hand-placed simultaneously on both sides of the pipe for the full trench width and hand-tamped with approved tamping sticks supplemented by "walking in" and slicing with a shovel.

### 2.4 BACKFILL ABOVE THE PIPE ZONE

- A. Conform to applicable portions of Section 312300, EXCAVATION AND FILL.
- B. Do not backfill around service connections until inspected and approved by the ENGINEER.

### 2.5 LAYING AND JOINTING PIPE AND FITTINGS

- A. Lay pipe upgrade from connection to the sanitary sewer with bell or coupling ends upgrade. Pipe shall be laid in a straight line at uniform grade between

fittings, or on a uniform horizontal or vertical curvature achieved by deflecting the pipe joints within manufacturer's recommended limits.

- B. Maximum deflection permissible with any one fitting shall not exceed 45 degrees and shall be accomplished with long-radius curves or bends. Short-radius elbows or curves will not be permitted, except by permission of the ENGINEER.
- C. Make service connections to the sewer system at manholes only when directed by the ENGINEER. Where service connection pipe is connected to manholes or concrete structures, make the connection so the standard pipe joint is located not more than 1.5 feet from the structure.
- D. Provide ends of all inactive service connection lines with standard watertight plugs, caps, and stopper, suitably braced to prevent blowoff during internal hydrostatic or air testing.
- E. The first length of pipe, out from the tee on the lateral or main, shall not be greater than 3 feet in length.

## 2.6 LINE AND GRADE

- A. The CONTRACTOR shall establish line and grade to the tract of land to be serviced by the sewer system and shall perform all stakeout. At the pre-selected location of the service connections, a stake will be driven into the ground showing the depth of excavation required at the upstream end of the service connection.
- B. Install the sewer tee so as to locate the connection pipe within a horizontal distance of 1 foot either side of the pre-selected location.
- C. Batter boards will not be required, but lay the pipe uniformly between the tee or the top of the riser section and the stake. Where minimum slopes are used, lay the pipe by means of a good-quality builder's level, not less than 24 inches in length. Minimum slope shall be 1/4 inch per foot unless otherwise permitted by the ENGINEER, but in no case less than 1/8 inch per foot.

## 2.7 WATER SERVICES

- A. It is possible that water services will be located in the same trenches as existing sewer laterals. The CONTRACTOR shall notify the Florida Keys Aqueduct Authority when encountering water services.
- B. The CONTRACTOR shall either disconnect water services and reconnect after installing the sewer laterals or remove and replace the water services with new materials when water services are encountered. All materials and workmanship shall be in conformance with Florida Keys Aqueduct Authority standards. Work must be inspected by Authority personnel prior to backfilling and compaction. Removal and replacement of waterline services and fittings is incidental to sewer

service connections. No claim will be allowed for delays or additional compensation due to the existence of water services in the same trench as sewer laterals.

#### 2.8 DETECTION TAPE

- A. Detection tape shall be installed over all service connection pipe. It shall be placed in accordance with the manufacturer's recommendations directly over the pipe at a depth of 12 inches below final grade.

#### 2.9 SERVICE CONNECTION CLEANOUTS

- A. All pipe and fittings for cleanouts shall conform to applicable requirements herein, and gravel backfill around the cleanouts shall conform to imported pipe base and pipe zone material, herein.
- B. Construct in accordance with the Service Connection Cleanout as shown on the Sewer Service Connection Details on the Drawings.

#### 2.10 DISCONNECTING AND RECONNECTING EXISTING SERVICE CONNECTIONS

- A. On all existing services, disconnect existing service connections from existing sewers to be abandoned and reconnect them to the new sewers. It shall be the CONTRACTOR's responsibility to locate the existing service connections prior to installing the tee in the new sewer line.

END OF SECTION 333923

## SECTION 334101 - STORM PIPING

## PART 1.0 GENERAL

## 1.1 WORK INCLUDED

- A. This section covers the work necessary for the storm sewers and appurtenances, complete.

## 1.2 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE "SOIL AND GROUND WATER MANAGEMENT PLAN", DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2.0 PRODUCTS

## 2.1 GENERAL

- A. All storm drainpipes in the project shall be ADS polyethylene or Polyvinyl Chloride (PVC)
- B. Provide ADS Pipe Adapter flexible watertight Waterstop connection with pipe adapter for ADS Corrugated HDPE Pipe to storm structures, or approved equal ADS Pipe Adapters meeting the requirements of ASTM F 2510 and ASTM C 1478 for watertight flexible connections. Rapid set mortar shall be used with potable water; ground water shall not be used.

## 2.2 ADS POLYETHYLENE PIPE N-12 OR EQUAL

- A. This Specification covers the requirement of high-density polyethylene corrugated pipe with smooth interior for storm sewer. Nominal sizes 12, 15, 18, and 24 -inch are included.
- B. Material: Pipe and fittings shall be manufactured from high density polyethylene resin which shall meet or exceed the requirements of Type III, Category 4 of 5, Grade P33 or P34, Class C per ASTM D1248.
- C. Pipe Dimensions: the nominal size of the pipe is based on the nominal inside diameter of the pipe. The tolerance on the specified inside diameter shall be +3 percent, -1 percent, or 1/2 inch whichever is less. Lengths shall be not less than 99 percent of the stated quantity.
- D. Pipe Stiffness: The pipe shall have minimum pipe stiffness at 5 percent deflection as follows:
 

Diameter	Pipe Stiffness

(Inches)	(PSI)
12	45
15	42
18	40
24	34

- E. Tests shall be in accordance with ASTM D2412 with a minimum one-diameter sample length, a loading rate of 0.5 inch/min., and readings at 5 percent deflection.
- F. Hydraulics: The pipe shall have a minimum tested Manning's "n" value of 0.012.

### 2.3 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE AND FITTING:

- A. 15 inch diameter PVC sewer pipe and under for general service shall conform to ASTM D3034, standard dimension ratio not to exceed 26.
- B. PVC fittings for 15 inch diameter pipe and under for general service shall conform to ASTM D3034, standard dimension ratio not to exceed 35.
- C. PVC pipe for watermains 12 inches and smaller shall be AWWA C900, standard dimension. Dimension ratio not to exceed 18.
- D. PVC pipe for storm and sanitary sewer pipe larger than 15 inches shall be AWWA C905, standard dimension ratio, not to exceed 26.
- E. PVC additives and fillers including but not limited to stabilizers, antioxidants, lubricants, colorants, etc. shall not exceed 10 parts by weight per 100 of PVC resin in the compound.
- F. Plastic pipe and fittings shall meet all the requirements of AWWA C900 and shall be PVC-1120 pipe, having a cell classification of 1245A or 1245B, in accordance with ASTM D1784. Pipe 4 inches and larger shall be pressure rated Class 150 (DR 18) with cast iron pipe equivalent OD in accordance with AWWA C900. Pipe shall be equipped with a push-on type joint with elastomeric gasket that meets the requirements of ASTM D3139. Pipe smaller than 4 inches shall be PVC Schedule 80, in accordance with ASTM D1785. Schedule 80 pipe and fittings shall be threaded joint.

### 2.4 PIPE JOINTS

- A. ADS POLYETHYLENE PIPE JOINTS: The pipe shall be joined by split corrugated couplings at least seven corrugations wide and exceeding the soil tightness requirements of the AASHTO Standard Specification for Highway Bridges, Section 23 (2.23.3).
- B. POLYVINYL CHLORIDE (PVC) GRAVITY PIPE JOINTS: Joints shall be rubber gasketed type complying in all respects to the physical requirements of ASTM D3212 for gravity pipes. Gaskets shall conform to ASTM F477. Furnish complete information on basic gasket polymer and results of test of physical properties. Lubricant for jointing as approved by the pipe manufacturer.

### 2.5 PIPE BEDDING AND PIPE ZONE MATERIAL

- A. Pipe bedding and pipe zone material are identical and shall be free from dirt, clay balls, and organic material and forming to size No. 57 stone gradation as specified in the Standard Specifications or similar accepted material and shall be imported at the contractor's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock that has been crushed and graded to size as specified, will not be accepted for pipe bedding materials.
- B. Imported pipe bedding and pipe zone materials specified in this Section are subject to the following requirements:
  - 1. All tests necessary for the CONTRACTOR to locate an acceptable source of imported material shall be made by the CONTRACTOR. Certification that the material conforms to the Specification requirement along with copies of the test results from a qualified commercial testing laboratory shall be submitted to the ENGINEER for acceptance at least 10 days before the material is required for use. CONTRACTOR shall furnish all material samples the CONTRACTOR'S sole expense. Samples shall be representative and be clearly marked to show the source of the material and the intended use on the project. CONTRACTOR shall due sampling of the material source in accordance with ASTM D75. Also, the CONTRACTOR shall notify the ENGINEER at least 24 hours prior to sampling. The ENGINEER may, at the ENGINEER'S option, observe the sampling procedures. Tentative acceptance of the material source shall be based on an inspection of the source by the ENGINEER, and/or the certified test results submitted by the CONTRACTOR to the ENGINEER, at the ENGINEER'S discretion. No imported materials shall be delivered to the site until the proposed source and the ENGINEER has tentatively accepted the material's tests in writing. Final acceptance will be based on tests made on samples of material taken from the completed and compacted course. The completed course is defined as a course or layer that is ready for the next layer or the next phase of construction.
  - 2. Gradation tests by the CONTRACTOR shall be made on samples taken at the place of production prior to shipment. Samples of the finished project for gradation testing shall be taken from each 1,500 tons of prepared materials or more often as determined by the ENGINEER, if variation in gradation is occurring, or if the material appears to depart from the Specifications. Test results shall be forwarded to the ENGINEER within 48 hours after sampling.
  - 3. If tests conducted by the CONTRACTOR or the ENGINEER indicate that the material does not meet Specification requirements, material placement will be terminated until corrective measures are taken. Material that does not conform to the Specification requirements and is placed in the work shall be removed and replaced at the CONTRACTOR'S sole expense. Sampling and testing performed by the CONTRACTOR shall be done at the CONTRACTOR'S sole expense.

## PART 3.0 EXECUTION

### 3.1 LINE AND GRADE

- A. Installation of the pipe shall be in accordance with the manufacturer and either AASHTO Section 30 or ASTM Recommended Practice D2321.

- B. Do not deviate from line or grade, as established by the ENGINEER, more than 1/2 inch for line and 1/4 inch for grade, provided that such variation does not result in a level or reverse sloping invert. Measure for grade at the pipe invert not at the top of the pipe because of permissible variation in pipe wall thickness.
- C. All storm sewers shall be laid using a laser accepted by the ENGINEER. The beam shall be directed through the pipe. Batter boards or instrument laying will not be permitted. The laser shall be constantly shielded from the direct sun.
- D. The CONTRACTOR shall set offset stakes or other accepted method of controlling alignment and grade for excavation of trenches and for pipe laying. The CONTRACTOR shall submit in writing his proposed method of establishing line and grade to the ENGINEER for acceptance.

### 3.2 LAYING AND JOINTING PIPE AND FITTINGS

- A. Do not permit mud and foreign material to get into the pipe. During laying operations, do not permit debris, tools, clothing, or similar items to be placed in pipes.
- B. Pipe laying shall proceed upgrade with ends pointing in the direction of flow. After a section of pipe has been lowered into the trench, clean the ends of the pipe. Be careful in handling pipe to prevent breakage. Remove any pipe damaged and replace at the CONTRACTOR's sole expense.
- C. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the jointing assembly.
- D. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home," as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed. Pipe 21 inches and smaller shall be laid so the inside joint space does not exceed 3/8 inch in width.
- E. Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.
- F. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

### 3.3 BACKFILL AT THE PIPE ZONE

- A. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the pipe to a point 12 inches above the outside surface of the barrel of the pipe or to elevation plus 2.5 feet NGVD, whichever is higher.
- B. Pipe zone material as hereinbefore specified shall be used for the full depth of the pipe zone and for the full width of the excavated trench for all pipe.

- C. Hand place the material around the pipe in horizontal 6 inch layers and thoroughly hand tamp with accepted tamping sticks supplemented by "walking in" and slicing with a shovel. Backfill the area of the pipe zone from the horizontal centerline to a point 12 inches above the top outside surface of the barrel of the pipe with pipe zone material. Use particular attention in placing material on the underside of the pipe to provide a solid backing and to prevent lateral movement during the final backfilling procedure.
- D. DETECTION TAPE shall be used above every underground pipe.

### 3.4 MATERIALS TESTS AND INSPECTIONS

- A. Deflection Test: All PVC and ADS gravity stormwater pipes shall be tested for deflection after installation and backfill by pulling a round plug equal to 95.0 percent of pipe base inside diameter, as defined in the Appendices of ASTM D3034, through the completed pipeline. The mandrel shall be of a design that provides an accurate measure of excess deflection regardless of orientation. Mandrel testing shall be performed not less than 30 days after complete pipe installation.
- B. Lamping Test: City to perform Lamping test of all the installed stormwater pipes, prior to establishing flow to the associated gravity injection well, to verify the alignment and condition of the pipe. The lamp test shall be performed only after the contractor has completely cleaned the line to the satisfaction of the City. Should the lamp test indicate an alignment problem, the City shall be the sole judge of the need for replacement. The contractor shall supply all the equipment and labor necessary for the lamping (i.e. lamps, ladders).

### 3.5 CONNECTING TO EXISTING PIPING AND EQUIPMENT

- A. The CONTRACTOR shall verify exact location, material, alignment, joint, etc. of existing piping and prior to making the connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection.
- B. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including the most convenient ne valve, shall be installed.
- C. Where necessary or required for the purpose of making connections, the CONTRACTOR shall cut existing pipe lines in a manner to provide an approved joint. Where required, he shall weld beads, flanges or provide couplings or special pieces as needed.
- D. Where connections are to be made to existing piping, or when existing piping and fittings are to be reused in the work, the pipe and fittings shall be sand blasted, cleaned and mating surfaces shall be properly prepared. CONTRACTOR may not reuse bolts, nuts, washers or gaskets, and shall instead replace with new.

### 3.6 FINAL STORM SEWERS CLEANING

- A. Prior to final acceptance and final structure to structure inspection by the ENGINEER of the storm sewers system, completely flush or clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, and other foreign material from the storm sewers system at or near the closest downstream manhole. If necessary, use mechanical rodding equipment to remove

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accumulated mud, silt, and all other deposits from the storm sewer system at no additional cost to the OWNER.

- B. Upon the ENGINEER's final structure to structure inspection of the storm sewers system, if foreign matter and other construction debris are still prevalent in the system, reflush and clean the sections and portions of the lines as required.

END OF SECTION 334101

## SECTION 334413 - STORM STRUCTURES

## PART 1 GENERAL

## 1.1 WORK INCLUDED

- A. This section covers the work necessary for the catch basins and inlets complete.

## PART 2 PRODUCTS

## 2.1 CONCRETE

- A. Concrete structures shall meet the requirements of FDOT 400; Concrete structures. All structures shall be H-20 rated.

## 2.2 FORMS

- A. Forms shall be conformance with Section 425 of FDOT Standard Specifications for Road and Bridge Construction.

## 2.3 REINFORCING BARS

- A. Concrete structures shall meet the requirements of FDOT 400; Concrete structures.
- B. Repair damaged epoxy coating per Article 3.5 of this Section.

## 2.4 UNITS

- A. Inlet dimensions and details of construction shall conform to FDOT Roadway and Traffic Specifications and Design Standards.

## 2.5 PRECAST UNITS

- A. At the opinion of the Contractor, approved pre-cast units may be substituted for cast-in-place units. Pre-cast units shall conform to ASTM C478. All pre-cast units shall have epoxy-coated reinforcing bars. Submit details of proposed units to the ENGINEER for review. Concrete risers for extensions shall be a maximum of 6 inches high and of the same quality as the sections. ENGINEER shall review risers before installation.
- B. Provide ADS Pipe Adapter flexible watertight Waterstop connection with pipe adapter for ADS Corrugated HDPE Pipe to storm structures, or approved equal ADS Pipe Adapters meeting the requirements of ASTM F 2510 and ASTM C 1478 for watertight flexible connections. Rapid set mortar shall be used with potable water; ground water shall not be used.

## 2.6 MORTAR

- A. Standard premixed mortar conforming to ASTM C387, Type S, or proportion 1 part Portland cement to 2 parts clean, well-graded sand that will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the concrete.
- B. DO NOT USE GROUND WATER TO MIX MORTAR, arrange for and provide potable water.

## 2.7 FRAMES AND GRATINGS

- A. Cast iron frames and gratings for catch basins and storm drain inlets shall be as indicated. Bearing surfaces shall be clean and shall provide uniform contact. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30.
- B. All grates shall be H20 Traffic Rated and Galvanized coated.

## 2.8 BASE ROCK

- A. Base rock shall be crushed gravel or crushed rock, free from dirt, clay balls, and organic material, and conforming to size No. 57 graduation as specified in the Standard Specifications or similar accepted material and shall be imported, if necessary, at the Contractor's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock that has been crushed and graded to size as specified, will not be accepted for base rock.

## 2.9 PRECAST MANHOLE SECTIONS

- A. Precast manhole sections shall be minimum 48 inches in diameter, conforming to ASTM C478. Precast sections shall meet the permeability test requirements of ASTM C14. Minimum wall thickness shall be 4 inches. All manholes shall have epoxy-coated reinforcing bars. All manholes of less than 5 feet of depth shall have either flat top covers or concentric cones. Cones shall have same wall thickness and reinforcement as manhole section. Top and bottom of all sections shall be parallel. The Contractor's attention is directed to Paragraph MORTAR herein before.

## 2.10 PRECAST BASE SECTIONS AND BASES

- A. At the option of the Contractor, precast base sections or manhole bases may be used provided the Engineer approves all details of construction. Base sections shall have the base slab integral with sidewalls. Base slab shall be 6 inches thick with No. 4 epoxy-coated reinforcing bars, 8-inch centers, both directions in center of slab. Tie reinforcing steel to wall steel.

## 2.11 PRECAST BAFFLE BOX SECTIONS

- A. Precast manhole sections shall size shall be as specified on the drawings, conforming to ASTM C478. Precast sections shall meet the permeability test requirements of ASTM C14. Minimum wall thickness top, bottom, and sides shall be 8 inches. All manholes shall have epoxy-coated reinforcing bars. Reinforcing bars shall be 3" minimum from the edge. Top and bottom of all

sections shall be parallel. The Contractor's attention is directed to Paragraph MORTAR herein before. Baffle Boxes shall support H20 loading.

#### 2.12 MANHOLE AND BAFFLE BOX EXTENSIONS

- A. Concrete grade rings shall be H-20 rated and for extensions shall be a maximum of 6 inches high and shall be approved by Engineer before installation.
- B. HDPE adjustment rings shall be H-20 Rated and shall be approved by Engineer before installation
- C. Clay Brick and Shale Brick. This brick shall meet the requirements of AASHTO M 114, for Grade MW. and shall be approved by Engineer before installation
- D. Concrete Brick. Concrete brick shall meet the requirements of ASTM C 55 for Grade S-I, and shall be approved by Engineer before installation

In general, manhole and baffle box extensions will be used on all manholes in roads or streets or in other locations where a subsequent change in existing grade may be likely. Extensions will be limited to a maximum height of 12 inches. Finish grade for manhole covers shall conform to finished ground or street surface unless otherwise directed by the Engineer. The Contractor will be responsible for coordinating with the Engineer and Owner to determine the finish grade for manhole and baffle box covers and will make all adjustments necessary to bring manhole covers to that grade. Extensions shall lined with polypropylene and be watertight. Extensions shall meet the H-20 load rating; brick is used contractor is required to submit a shop drawing with an 18 inch concrete collar 4000 PSI 1-6 inches thick. Brick shall be installed using Rapid Set Mortar Mix or equal. This cost shall be incidental to the cost of installing the structure. Masonry unit's manufacturer shall submit six test certificates furnished to the Engineer. Such certificates shall be signed by an authorized agent of the manufacturer, and identified by project number.

#### 2.13 BAFFLE BOX / MANHOLE FRAMES AND COVERS:

- A. Cast iron of size and shape detailed on the Drawings. Covers shall have the word STORM SEWER, as appropriate, in 2-inch raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A-48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points.

#### 2.14 WATERTIGHT

- A. Provide water tight manhole ring and covers, and extensions.
- B. Provide ADS Pipe Adapter flexible watertight Waterstop connection with pipe adapter for ADS Corrugated HDPE Pipe to storm structures, or approved equal ADS Pipe Adapters meeting the requirements of ASTM F 2510 and ASTM C 1478 for watertight flexible connections. Rapid set mortar shall be used with potable water; ground water shall not be used.

## 2.15 NUTRIENT SEPARATING BAFFLE BOX

- A. Nutrient Separating Baffle Box and associated cage screen, skimmer, well screen, and turbulence deflectors, shall be as manufactured by Suntree Technologies, Inc., Cocoa, Fl.
- B. Hydrocarbon boom shall be Type 4 Polymer Absorbent as specified by Suntree Technologies, Inc., Cocoa, Fl. or approved equal.
- C. Baffle boxes requiring catch basin – frames and grates shall be USF # 4160-6611 galvanized; cost shall be included in the bidder's proposal. Note; all grates are required to be galvanized.

## PART 3 EXECUTION

### 3.1 EXCAVATION AND BACKFILL

- A. Excavation as required to accomplish the construction. Backfill shall be as specified for the adjoining pipe trench.

### 3.2 CONSTRUCTION OF CATCH BASINS AND INLETS

- A. Construct inlets and catch basins at the locations shown and in accordance with the Drawings. Construct forms to the dimensions and elevations required. Forms shall be tight and well braced. Chamfer corners of forms.
- B. Prior to placing the concrete, remove all water and debris from the forms. Moisten forms just prior to placing the concrete. Handle concrete from the transporting vehicle to the forms in a continuous manner as rapidly as practical without segregation or loss of ingredients. Immediately after placing, compact concrete with a mechanical vibrator. Limit the duration of vibration to the time necessary to produce satisfactory consolidation without causing segregation.
- C. Screed the top surface of exposed slabs and walls. When the initial water has been absorbed, float the surfaces with a wood float and lightly trowel with a steel trowel to a smooth finish free from marks or irregularities. Finish exposed edges with a steel-edging tool. Remove forms and patch any defects in the concrete with mortar mixed in the same proportions as the original concrete mix.
- D. Cure concrete by preventing the loss of moisture for a period of 7 days. Accomplish with a membrane-forming curing compound. Apply the curing compound immediately after removal of forms or finishing of the slabs. Protect concrete from damage during the 7-day curing period.

### 3.3 PLACING PRECAST UNITS

- A. Remove water from the excavation. Place a minimum of 6 inches of rock base and thoroughly compact with a mechanical vibrating or power tamper.

### 3.4 EXTENSIONS

- A. Install extensions to height determined by ENGINEER. Lay risers in mortar with sides plumb and tops to grade. Joints shall be sealed with mortar, with interior and exterior troweled smooth.

Prevent mortar from drying out and cure by applying a curing compound. Extensions shall be watertight.

### 3.5 REPAIR OF DAMAGED STRUCTURES EPOXY COATING ON REINFORCING BARS

- A. Damaged STRUCTURES shall be repaired with Rapid Set Mortar Mix and REINFORCING BARS shall be repaired with epoxy coating material conforming to ASTM A775. Repair shall be done in accordance with the patching material manufacturer's recommendations.

### 3.6 INSTALLATION OF FRAMES AND GRATES

- A. Set frames and grates at elevations indicated or as determined in the field and in conformance with the Drawings.
- B. Frames may be cast in, or shall be set in mortar, they shall be H-20 rated.
- C. Frames set with brick; contractor is required to submit a shop drawing with an 18 inch concrete collar 4000 PSI 1-6 inches thick. Brick shall be installed using Rapid Set Mortar Mix or equal. This cost shall be incidental to the cost of installing the structure. Masonry unit's manufacturer shall submit six test certificates furnished to the Engineer. Such certificates shall be signed by an authorized agent of the manufacturer, and identified by project number.

### 3.7 PLACING PRECAST MANHOLE SECTIONS

#### A. Section Installation:

- 1) Thoroughly clean ends of sections to be joined.
- 2) Thoroughly wet joint with water prior to placing mortar.
- 3) Place mortar on groove of lower section.
- 4) Set next section in-place.
- 5) Fill joint completely with mortar of proper consistency.
- 6) Trowel interior and exterior surfaces smooth on standard tongue-and-groove joints.
- 7) Prevent mortar from drying out and cure by applying an approved curing compound or comparable approved method.
- 8) Do not use mortar mixed for longer than 30 minutes.
- 9) Chip out and replace cracked or defective mortar.
- 10) Completed Manholes: Rigid and watertight.

#### B. Preformed Plastic Gaskets: Install in accordance with manufacturer's instructions and the following:

- 1) Carefully inspect precast manhole sections to be joined.
- 2) Do not use sections with chips or cracks in the tongue.
- 3) Use only pipe primer furnished by gasket manufacturer.
- 4) Install gasket material in accordance with manufacturer instructions.
- 5) Fusion weld top and bottom 2-inch minimum wide strip over each section joint, where required.
- 6) Completed Manholes: Rigid and watertight.

### 3.8 BAFFLE BOX COMPONENTS

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Cage screen, turbulence deflectors, wells screen, skimmer, and hydrocarbon boom shall be installed by Suntree Technologies representative. Contact Suntree Technologies, Cocoa, Florida (321 637-7552) to coordinate installation

**3.9 CLEANING**

- A. Upon completion, clean each structure of all silt, debris, and foreign matter.

**END OF SECTION 334413**

## SECTION 33 46 00 - SUBDRAINAGE

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. This Section includes subdrainage systems for areas on site including landscaped areas. This section is not to be used for subsurface drainage for structures.
- B. Related Requirements:
  - 1. Section 33 41 01 – Storm Piping

## 1.02 DEFINITIONS

- A. The phrase "DOT Specifications" shall refer to the most current Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

## 1.03 SUBMITTALS

- A. Product Data: For pipe and fittings and filter fabric

## 1.04 RELATED DOCUMENTS

- A. **PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.**

## PART 2 – PRODUCTS

## 2.01 PIPING MATERIALS

- A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, fitting, and joining materials.

## 2.02 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
  - 1. Couplings: Manufacturer's standard, band type.

### 2.03 SOLID-WALL PIPES AND FITTINGS

- A. PE Drainage Tubing and Fittings: AASHTO M 252, Type S, corrugated, with smooth waterway, for coupled joints.
  - 1. Couplings: AASHTO M 252, corrugated, band type, matching tubing and fittings.

### 2.04 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
- B. Structure Type: Nonwoven, needle-punched continuous filament or woven, monofilament or multifilament per drawings.

## PART 3 – EXECUTION

### 3.01 EARTHWORK

- A. Excavating, trenching, and backfilling are specified elsewhere in these specifications.

### 3.02 PIPING APPLICATIONS

- A. Underground Subdrainage Piping: Use as indicated on drawings.
  - 1. Perforated PE pipe and fittings, couplings, and coupled joints.
- B. Header Piping:
  - 1. PE drainage tubing and fittings, couplings, and coupled joints.

### 3.03 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
  - 1. Lay perforated pipe with perforations down.
  - 2. Lay all pipe per drawings or with minimum slope of 0.5 percent.
  - 3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install PE piping according to ASTM D 2321.

3.04 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.05 FIELD QUALITY CONTROL

A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.06 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600