Solicitation 12201-293

Coconut Isle Bridge Replacement P12089

Bid Designation: Public

CITY OF FORT LAUDERDALE

City of Fort Lauderdale

Bid 12201-293
Coconut Isle Bridge Replacement P12089

Bid Number	12201-293
Bid Title	Coconut Isle Bridge Replacement P12089
Bid Start Date	Nov 5, 2018 3:56:17 PM EST
Bid End Date	Dec 18, 2018 2:00:00 PM EST
Question & Answer End Date	Dec 3, 2018 5:00:00 PM EST
Bid Contact	Ginah Joseph Procurement Specialist II Finance 954-828-4797 gjoseph@fortlauderdale.gov
Contract Duration	**One Time Purchase**
Contract Renewal	Not Applicable
Prices Good for	**120 days**
Pre-Bid Conference	**Nov 19, 2018 10:00:00 AM EST** **Attendance is optional** **Location: Coconut Isle Drive over Grande Canal**

Bid Comments

Sealed bids will be received electronically until 2:00 p.m., local time, on TUESDAY DECEMBER 11, 2018 and opened immediately thereafter in the 5th Floor Conference Room, City Hall, City of Fort Lauderdale, Florida, 100 North Andrews Avenue, Fort Lauderdale, Florida 33301, for BID NO., 12201-293, PROJECT NO., 12089 COCONUT ISLE BRIDGE REPLACEMENT

This project consists of Drawing File No., 4-139-62 , thirty-one (31) sheets

This project is located at Coconut Isle Drive over Grande Canal in the City of Fort Lauderdale. The work to be accomplished under this contract includes, but is not limited to, removal of existing bridge, construction of new bridge, seawall construction, maintenance of traffic, utility relocation, and roadway construction.

NOTE: Payment on this contract will be made by check.

Licensing Requirements: Possession of a Broward County (Florida) General Engineered Construction Builder Contractor (GITS) License and/or one that is appropriately issued by the State of Florida is required for this project.

Pre-Bid Meeting/Site visit: A pre-bid meeting and site visit will be held on MONDAY NOVEMBER 19, 2018 at 10:00 a.m., local time, at Coconut Isle Drive over Grande Canal, Bridge No. 865732.

While attendance is not mandatory, it is strongly suggested that all contractors attend the pre-proposal conference and site visit since tours at other times might not be available . It will be the sole responsibility of the bidder to inspect the City's location and become familiar with the scope of the City's requirements and systems prior to submitting a proposal. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a proposal will be considered evidence that the proposer has familiarized himself with the nature and extent of the work, equipment, materials, and labor required.

Bidding blanks may be obtained free of charge at BIDSYNC.COM. Drawing Plans are on file in the Public

Works Department, City of Fort Lauderdale at 100 North Andrews Avenue, 4th floor, (Monday through Friday, 8:00 am to 4:30 pm) at a NON-REFUNDABLE cost of $50.00

(including sales tax per set). Only cash or cashier's check made payable to the City of Fort Lauderdale are accepted.

It will be the sole responsibility of the bidder to ensure that his bid is submitted prior to the bid opening date and time listed. PAPER BID SUBMITTALS WILL NOT BE ACCEPTED. BIDS MUST BE SUBMITTED ELECTRONICALLY VIA BIDSYNC.COM

Bid Security : A certified check, cashier's check, bank officer's check or bid bond for FIVE percent (5%) of the bid amount, made payable to the City of Fort Lauderdale, Florida, shall accompany each proposal.

Bid Bonds:

Bidders can submit bid bonds for projects four different ways:

1) BidSync allows bidders to submit bid bonds electronically directly through their system using Surety 2000 . For more information on this feature and to access it, contact BIDSYNC customer care department.

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3) Bidders can hand deliver their bid bond in a sealed envelope to the Finance Department/Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, FL 33301-1016, before time of bid opening, with the company name, bid number and title clearly indicated on the envelope.

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Certified Checks, Cashier's Checks and Bank Drafts
These cannot be submitted via BIDSYNC, nor are their images allowed to be uploaded and submitted with your electronic bid. These forms of securities, as well as hard copy bid bonds, must be received on or before the Invitation to Bid (ITB) opening date and time, at the Finance Department, Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, FL 33301-1016, with the bid number and title clearly indicated on the envelope.

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The City of Fort Lauderdale reserves the right to waive any informality in any or all bids and to reject any or all bids.
For information concerning technical specifications, please utilize the question/answer feature provided by BIDSYNC at www.bidsync.com . Questions of a material nature must be received prior to the cut-off date specified in the solicitation. Material changes, if any, to the scope of services or bidding procedures, will only be transmitted by written addendum. (See addendum section of BIDSYNC Site). Contractors please note: No part of your bid can be submitted via FAX. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a bid will be considered evidence that the Contractor has familiarized himself with the nature and extent of the work, equipment, materials, and labor required. The entire bid response must be submitted in accordance with all specifications contained in this solicitation.

Information on bid results and projects currently out to bid can be obtained on the City's website – http://www.fortlauderdale.gov/departments/finance/procurement-services . For general inquiries, please call (954) 828-5933.
Added on Nov 19, 2018:
This addendum is being issued to make the following change(s):
1. Upload the following documents:
a. Core Boring

b. Topographic Survey

All other terms, conditions, and specifications remain unchanged.
Added on Nov 26, 2018:
Uploaded the Pre-Bid Meeting Sign-in Sheet.
All other terms, conditions, and specifications remain unchanged.

Added on Nov 29, 2018:
Uploaded letters from U.S. Army Corps of Engineers and the United States Coast Guard
All other terms, conditions, and specifications remain unchanged.
Added on Dec 5, 2018:
This addendum is being issued to make the following change(s):
Added a line item as an Alternate Bid to:
Furnish all materials, labor, and equipment to remove two existing concrete footing. Each footing is 4 feet thick, and 15 feet by 10 foot long, and the top elevation is 2 foot below the mudline. Removal effort in excesses of this will be considered unforeseen work and will be compensated in accordance with FDOT Standard Specification 4-3 Alteration of Plans or of Character of Work.
All other terms, conditions, and specifications remain unchanged.
Added on Dec 10, 2018:
This addendum is being issued to make the following change(s):

1. Uploaded revised Drawing - Sheet No. S14 – Temporary Support

2. Extended bid end date to 12/18/2018

All other terms, conditions, and specifications remain unchanged.

Addendum # 1

New Documents	**Addendum 1.pdf** **Core Boring_Coconut Isles Bridge.pdf** **Topographic Survey.pdf**

Addendum # 2

New Documents	**Addendum 2.pdf**

New Lot: ALTERNATE BID

Changes were made to the following items:
Remove two existing concrete footing

Addendum # 3

New Documents	**Addendum 3.pdf** **12201-293 P12089-S14-TEMP-TEMPORARY SUPPORT PE-rev01 3.pdf**		
Previous End Date	Dec 11, 2018 2:00:00 PM EST	New End Date	Dec 18, 2018 2:00:00 PM EST

Item Response Form

Item	**12201-293--01-01 -** BASE BID: Mobilization
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description
Mobilization, demobilization (move-in and move out), staging of equipment, insurance, base cost and other fixed costs.

Item	**12201-293--01-02 -** BASE BID: Maintenance of Traffic
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description
Maintenance of traffic (MOT). Furnish all materials, labor, and equipment to maintain traffic within the limits of the project for the duration of the construction period.

Item	**12201-293--01-03 -** BASE BID: Turbidity Barrier
Lot Description	BASE BID
Quantity	**120 linear foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 120

Description
Furnish all materials, labor, and equipment to install floating turbidity barrier at all required locations where work is in progress.

Item	**12201-293--01-04 -** BASE BID: Settlement vibration and groundwater monitoring
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description
Provide settlement, vibration and groundwater monitoring in accordance with the requirements of Section 108 of the FDOT Standard Specifications.

Item	**12201-293--01-05 -** BASE BID: Remove and dispose of the materials from existing **structures.**
Lot Description	BASE BID
Quantity	**3512 square foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 3512

Description
Furnish all materials, labor, and equipment to remove and dispose of the materials from existing structures.

Item	**12201-293--01-06 -** BASE BID: Remove and dispose of the materials from existing bulkhead.
Lot Description	BASE BID
Quantity	**135 linear foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 135

Description
Furnish all materials, labor, and equipment to remove and dispose of the materials from existing bulkhead

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Item	**12201-293--01-07 -** BASE BID: Soil Compaction
Lot Description	BASE BID
Quantity	**165 square yard**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 165

Description
Furnish all materials, labor, and equipment to perform soil compaction

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Item	**12201-293--01-08 -** BASE BID: Flowable fill
Lot Description	BASE BID
Quantity	**300 cubic yard**
Unit Price	

Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 300

Description
Furnish all materials, labor, and equipment to perform the installation of flowable fill

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Item **12201-293--01-09 -** BASE BID: Stabilization 4 inches optional base group 1 (type b12.5 only)
Lot Description BASE BID
Quantity **305 square yard**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 305

Description
Furnish all materials, labor and equipment to install stabilization, 4 inches optional base group 1 (type b12.5 only)

Item **12201-293--01-10 -** BASE BID: Install prepared soil layer
Lot Description BASE BID
Quantity **126 square yard**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 126

Description
Furnish all materials, labor, and equipment to installed prepared soil layer

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Item **12201-293--01-11 -** BASE BID: Mill Pavement
Lot Description BASE BID
Quantity **165 square yard**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 165

Description
Furnish all materials, labor, and equipment to mill existing pavement up to 1-1/2 inches thick.

Item **12201-293--01-12 -** BASE BID: Friction course
Lot Description BASE BID

Quantity **18.4 tons**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 18.4

Description
Furnish all materials, labor and equipment to install type fc 12.5 friction course (traffic level A) (1.5 inches)

Item **12201-293--01-13 -** BASE BID: Install plain neoprene bearing pads

Lot Description BASE BID

Quantity **1.2 cubic feet**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1.2

Description
Furnish all materials, labor and equipment to install plain neoprene bearing pads

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Item **12201-293--01-14 -** BASE BID: Concrete Class II, approach slabs

Lot Description BASE BID

Quantity **74.5 cubic yard**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 74.5

Description
Furnish all materials, labor and equipment to install approach slabs

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Item **12201-293--01-15 -** BASE BID: Concrete Class IV, superstructure deck

Lot Description BASE BID

Quantity **43.2 cubic yard**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 43.2

Description
Furnish all materials, labor, and equipment to construct new concrete class IV, superstructure deck

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Item **12201-293--01-16 -** BASE BID: Concrete Class IV, superstructure bent cap

Lot Description BASE BID

Quantity **35.8 cubic yard**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 35.8

Description
Furnish all materials, labor and equipment to install bent cap

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Item **12201-293--01-17 -** BASE BID: Construct new seawall concrete cap

Lot Description BASE BID

Quantity **20.7 cubic yard**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 20.7

Description
Furnish all materials, labor, and equipment to construct new seawall concrete cap (30 inches x 16 inches), according to the details shown on the project plans including, but not limited to, removal of deteriorated existing one, and hauling away and disposing of demolished material at an approved County site.

Item **12201-293--01-18 -** BASE BID: Bridge deck grooving

Lot Description BASE BID

Quantity **223 square yard**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 223

Description
Furnish all materials, labor and equipment to construct bridge deck grooving, deck thickness less than 8.5 inches

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Item **12201-293--01-19 -** BASE BID: Pressure Wash/Clean/Seal

Lot Description BASE BID

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Fort Lauderdale**

See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1

Description
Furnish all materials, labor, and equipment to pressure wash, clean and seal with penetrant sealant, the concrete deck-riding surface, approach slabs, and sidewalks.

Item	**12201-293--01-20 -** BASE BID: Miscellaneous reinforcement bars
Lot Description	BASE BID
Quantity	**31576 pounds**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 31576

Description
Furnish all materials, labor, and equipment to install Miscellaneous reinforcement bars

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Item	**12201-293--01-21 -** BASE BID: Prestressed slab units, variable width 30**-47 inches, thickness 12 inches**
Lot Description	BASE BID
Quantity	**376 linear foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 376

Description
Furnish all materials, labor, and equipment to install prestressed slab units, variable width 30-47 inches, thickness 12 inches

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Item	**12201-293--01-22 -** BASE BID: Install Steel Sheet Piling
Lot Description	BASE BID
Quantity	**800 square foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 800

Description
Furnish all materials, labor, and equipment to install steel sheet piling for Construction Staging to remain

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Item	**12201-293--01-23 -** BASE BID: Construct concrete sheet piling, 10 inch x 30 inch
Lot Description	BASE BID
Quantity	**1391 linear foot**
Unit Price	

Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1391

Description
Furnish all materials, labor, and equipment to construct concrete sheet piling, 10 inches x 30 inches

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Item **12201-293--01-24 -** BASE BID: Pre**-stressed concrete vertical test pile**
Lot Description BASE BID
Quantity **160 linear foot**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 160

Description
Furnish all materials, labor, and equipment to furnish two (2) 18 inches x18 inches pre-stressed concrete vertical test pile, inspected and certified at plant, delivered to the job site, 80 feet long.

Item **12201-293--01-25 -** BASE BID: Pre**-stressed concrete vertical pile**
Lot Description BASE BID
Quantity **402 linear foot**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 402

Description
Furnish all materials, labor, and equipment to furnish six (6) 18 inches x18 inches pre-stressed concrete vertical pile, inspected and certified at plant, delivered to the job site, 67 feet long.

Item **12201-293--01-26 -** BASE BID: Remove and dispose expansion joints
Lot Description BASE BID
Quantity **78 linear foot**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 78

Description
Furnish all materials, labor, and equipment to remove and dispose of existing joint. Seal, clean and install new one according to the details shown on the plans

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Item	**12201-293--01-27 -** BASE BID: Temporary support
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description
Furnish all materials, labor, and equipment to furnish temporary support

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Item	**12201-293--01-28 -** BASE BID: Concrete traffic barrier
Lot Description	BASE BID
Quantity	**104 linear foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 104

Description
Furnish all materials, labor, and equipment to furnish concrete traffic barrier

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Item	**12201-293--01-29 -** BASE BID: Performance turf
Lot Description	BASE BID
Quantity	**126 square yard**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 126

Description
Furnish all materials, labor, and equipment to furnish performance turf

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Item	**12201-293--01-30 -** BASE BID: Conduit, furnish & install, embedded **-railings**
Lot Description	BASE BID
Quantity	**95 linear foot**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 95

Description

Furnish all materials, labor, and equipment to furnish & install conduit and embedded-railings

Item	**12201-293--01-31 -** BASE BID: Remove and relocate 8 inch Water Main and 4 inch Sewer **Line**
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description

Furnish all materials, labor, and equipment to remove existing 8-inches water main and 4-inches running along the sides, as shown on the construction plans, including but not limited to, removal of pipe supports, deteriorated pipe sleeves, hauling away of removed materials, and incidentals to complete same.

Item	**12201-293--02-01 -** ALTERNATE BID: Remove two existing concrete footing
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale** See ITB Specifications See ITB Specifications Fort Lauderdale FL 33301 **Qty** 1

Description

Furnish all materials; labor and equipment to remove two existing concrete footing. Each footing is 4 feet thick, and 15 feet by 10 foot long, and the top elevation is 2 foot below the muldine. The removal effort in excesses of this will be considered unforeseen work and will compensate in accordance with FDOT Standard Specification 4 through 3 Alteration of Plans or of Character of Work.

Addendum # 2

Previous Title		New Title	Remove two existing concrete footing
Added Item			

CITY OF FORT LAUDERDALE
CONTRACT AND SPECIFICATIONS PACKAGE

BID NO. 12201-293

PROJECT NO. 12089

COCONUT ISLE BRIDGE REPLACEMENT

Issued on Behalf of: The Public Works Department
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

CONNIE HAYMAN
PROJECT MANAGER II

GINAH JOSEPH
PROCUREMENT SPECIALIST II
Telephone: (954) 828-4797 E-mail: gjoseph@fortlauderdale.gov

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Description **Pages**

DRAWING

APPENDIX

Note: **The following documents are available electronically for completion and documents must be returned with your bid along with your bid security, proof of insurance, and proof of required licenses/certification**

CITB Prime Contractor ID
CITB Questionnaire Sheets
CITB Local Business Price Preference Certification
CITB Non-Collusion
Non-Discrimination Certification
CITB Contract Payment Method
CITB Construction Bid Certification

INVITATION TO BID

Sealed bids will be received electronically until 2:00 P.M., local time, on **TUESDAY DECEMBER 11, 2018,** and opened immediately thereafter in the 5th Floor Conference Room, City Hall, 100 North Andrews Avenue, Fort Lauderdale, Florida, 33301, for **BID NO. 12201-293, PROJECT NO., 12089 COCONUT ISLE BRIDGE REPLACEMENT**

This project consists of Drawing File No. **4-139-62, thirty-one (31)** sheets.

This Project is located at Coconut Isle Drive over Grande Canal; Bridge No. 865732. The work to be accomplished under this contract includes, but is not limited to, removal of existing bridge, construction of new bridge, seawall construction, maintenance of traffic, utility relocation, and roadway construction.

NOTE: Payment on this contract will be made by Visa or MasterCard.

Licensing Requirements: Possession of a Certified General Contractor in the State of Floridais required for this Project.

Pre-Bid Meeting/Site visit: A pre-bid meeting and/or site visit will be held on MONDAY NOVEMBER 19, 2018, at 10:00 a.m., local time, at Coconut Isle Drive over Grande Canal, Bride No. 865732

It will be the sole responsibility of the bidder to attend the pre-bid/site visit to inspect the City's location(s) facilities systems prior to submitting a bid. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a proposal will be considered evidence that the proposer has familiarized himself with the nature and extent of the work, equipment, materials, and labor required.

Bidding blanks may be obtained **free of charge** at BIDSYNC.COM. Drawing Plans are on file in the Public Works Department, City of Fort Lauderdale, at 100 North Andrews Avenue, 4th floor, (Monday thru Friday 8:00 am to 4:30 pm) at a **NON-REFUNDABLE cost of $50.00 (including sales tax per set)**. Only cash or cashier's check made payable to the City of Fort Lauderdale are accepted.

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INSTRUCTIONS TO BIDDERS (Continued)

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Information on bid results and projects currently out to bid can be obtained on the City's website – http://www.fortlauderdale.gov/departments/finance/procurement-services. For general inquiries, please call (954) 828-5933.

INSTRUCTIONS TO BIDDERS

The following instructions are given for the purpose of guiding bidders in properly preparing their bids or proposals. These directions have equal force and weight with the specifications and strict compliance is required with all of these provisions.

QUALIFICATIONS OF BIDDERS – No proposal will be accepted from, nor will any contract be awarded to, any person who is in arrears to the CITY OF FORT LAUDERDALE, upon any debt or contract, or who has defaulted, as surety or otherwise, upon any obligation to the City, or who is deemed irresponsible or unreliable by the City Commission of Fort Lauderdale.

PERSONAL INVESTIGATION - Bidders shall satisfy themselves by personal investigation, and by such other means as they may think necessary or desirable, as to the conditions affecting the proposed work and the cost. No information derived from maps, plans, specifications, or from the Engineer, City Manager, or their assistants shall relieve the Contractor from any risk or from fulfilling all terms of the contract.

INCONSISTENCIES – Any seeming inconsistency between different provisions of the plans, specifications, proposal or contract, or any point requiring explanation must be inquired into by the bidder, in writing, at least ten (10) days prior to the time set for opening proposals. After proposals are opened, the bidders shall abide by the decision of the Engineer as to such interpretation.

ADDENDA AND INTERPRETATIONS - No interpretations of the meaning of the plans, specifications or other contract documents will be made orally to any bidder. Prospective bidders must request such interpretation in writing as instructed in the bid package. To be considered, such request must be received by the Questions and Answers deadline as indicated in BIDSYNC.COM. Material changes, if any, to the scope of services or bidding procedures will only be transmitted by written addendum. **It is the bidder's responsibility to verify if addendums have been issued in BIDSYNC.COM.** Failure of any bidder to receive any such addenda or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become a part of the contract document. **Bidder** shall verify **in BIDSYNC.COM** that he has all addenda before submitting a bid.

LEGAL CONDITIONS - Bidders are notified to familiarize themselves with the provisions of the laws of the State of Florida relating to hours of labor on municipal work, and with the provisions of the laws of the State of Florida and the Charter and the ordinances of the City of Fort Lauderdale.

PUBLIC ENTITY CRIMES - A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a Contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO for a period of thirty-six (36) months from the date of being placed on the convicted vendor list.

FORMS OF PROPOSALS - Each proposal and its accompanying statements must be made on the blanks provided. THE FORMS MUST BE SUBMITTED ELECTRONICALLY, IN GOOD ORDER WITH ALL BLANKS COMPLETED, and must show the name of the bidder and a statement as to its contents.

INSTRUCTIONS TO BIDDERS (continued)

FORMS OF PROPOSALS (CONTINUED) - The proposal must be signed by one duly authorized to do so, and in case signed by a deputy or subordinate, the principal's properly written authority to such deputy or subordinate must accompany the proposal. No proposal will be accepted, for any reason whatsoever, which is not submitted to the City as stated above, within the specified time.

INSURANCE - Contractor shall provide and shall require all of its sub-contractors to provide, pay for, and maintain in force at all times during the term of the Agreement, such insurance, including Property Insurance (Builder's Risk), Commercial General Liability Insurance, Business Automobile Liability Insurance, Workers' Compensation Insurance, Employer's Liability Insurance, and Umbrella/Excess Liability, as stated below. Such policy or policies shall be issued by companies authorized to do business in the State of Florida and having agents upon whom service of process may be made in the State of Florida.

BID BOND - A certified check, cashier's check or bank officer's check, for the sum set forth in the advertisement, made payable to the City of Fort Lauderdale, Florida, or bid bond in such amount, shall accompany each proposal as evidence of the good faith and responsibility of the bidder. The check or bond shall be retained by the City as liquidated damages should the bidder refuse to or fail to enter into a contract for the execution of the work embraced in this proposal, in the event the proposal of the bidder is accepted. Retention of such amount shall not be construed as a penalty or forfeiture.

The above bond or check shall be a guarantee that the bidder will, if necessary, promptly execute a satisfactory contract and furnish good and sufficient bonds. As soon as a satisfactory contract has been executed and the bonds furnished and accepted, the check or bond accompanying the proposal of the successful bidder will be returned to him. The certified or other checks or bid bonds of the unsuccessful bidders will be returned to them upon the acceptance of the bid of the successful bidder. If the successful bidder shall not enter into, execute, and deliver such a contract and furnish the required bonds within ten (10) days after receiving notice to do so, the certified or other check or bid bond shall immediately become the property of the City of Fort Lauderdale as liquidated damages. Retention of such amount shall not be construed as a penalty or forfeiture.

FILLING IN BIDS - All prices must be electronically submitted in the proposal pages, and all proposals must fully cover all items for which proposals are asked and no other. Bidders are required to state the names and places of residence of all persons interested, and if no other person is interested, the bidder shall distinctly state such fact and shall state that the proposal is, in all respects, fair and without collusion or fraud. Where more than one person is interested, it is required that all persons interested or their legal representative make all verification and subscribe to the proposal.

PRICES QUOTED: Deduct any discount offered and quote firm net unit prices. In the case of a discrepancy in computing the amount of the bid, the unit price quoted will govern. All prices quoted shall be F.O.B. destination, freight prepaid (Bidder pays and bears freight charges, Bidder owns goods in transit and files any claims), unless otherwise stated in Special Conditions. Each item must be bid separately. No attempt shall be made to tie any item or items contained in the ITB with any other business with the City.

BIDS FIRM FOR ACCEPTANCE: Bidder warrants, by virtue of bidding, that his bid and the prices quoted in his bid will be firm for acceptance by the City for a period of one hundred and twenty (120) days from the date of bid opening unless otherwise stated in the ITB. The City shall award contract within this time period or shall request to the recommended awarded vendor an extension to hold pricing, until products/services have been awarded.

ADDITIONAL ITEMS OR SERVICES: The City may require additional items or services of a similar nature, but not specifically listed in the contract. The Contractor agrees to provide such items or

services, and shall provide the City prices on such additional items or services. If the price(s) offered are not acceptable to the City, and the situation cannot be resolved to the satisfaction of the City, the City reserves the right to procure those items or services from other vendors, or to cancel the contract upon giving the Contractor thirty (30) days written notice.

DELETION OR MODIFICATION OF SERVICES: The City reserves the right to delete any portion of the Contract at any time without cause, and if such right is exercised by the City, the total fee shall be reduced in the same ratio as the estimated cost of the work deleted bears to the estimated cost of the work originally planned. If work has already been accomplished on the portion of the Contract to be deleted, the Contractor shall be paid for the deleted portion on the basis of the estimated percentage of completion of such portion.

If the Contractor and the City agree on modifications or revisions to the task elements, after the City has approved work to begin on a particular task or project, and a budget has been established for that task or project, the Contractor will submit a revised budget to the City for approval prior to proceeding with the work.

CAUSES FOR REJECTION - No proposal will be canvassed, considered or accepted which, in the opinion of the City Commission, is informal or unbalanced, or contains inadequate or unreasonable prices for any items; each item must carry its own proportion of the cost as nearly as is practicable. Any alteration, erasure, interlineation, or failure to specify bids for all items called for in the schedule shall render the proposal informal.

REJECTION OF BIDS - The City reserves the right to reject any bid if the evidence submitted by the bidder, or if the investigation of such bidder, fails to satisfy the City that such bidder is properly qualified to carry out the obligations and to complete the work contemplated. Any or all proposals will be rejected, if there is reason to believe that collusion exists among bidders. A proposal will be considered irregular and may be rejected, if it shows serious omissions, alterations in form, additions not called for, conditions or unauthorized alternates, or irregularities of any kind. The City reserves the right to reject any or all proposals and to waive such technical errors as may be deemed best for the interests of the City.

BID PROTEST PROCEDURE: Any proposer or bidder who is not recommended for award of a contract and who alleges a failure by the City to follow the City's procurement ordinance or any applicable law may protest to the Procurement Division – Procurement Manager, by delivering a letter of protest within five (5) days after a Notice of Intent to award is posted on the City's website at the following link: http://www.fortlauderdale.gov/departments/finance/procurement-services/notices-of-intent-to-award. The complete protest ordinance may be found on the City's website at the following link:
https://library.municode.com/fl/fort_lauderdale/codes/code_of_ordinances?nodeId=COOR_CH2AD_ARTVFI_DIV2PR_S2-182DIREPR

WITHDRAWALS - Any bidder may, without prejudice to himself, withdraw his proposal at any time prior to the expiration of the time during which proposals may be submitted. Such request for withdrawal must be in writing and signed in the same manner and by the same person who signed the proposal. After expiration of the period for receiving proposals, no proposal can be withdrawn, modified, or explained.

CONTRACT - The bidder to whom award is made shall execute a written contract to do the work and maintain the same in good repair until final acceptance by the proper authorities, and shall furnish

good and sufficient bonds as specified within ten (10) days after receiving such contract for execution. If the bidder to whom the first award is made fails to enter into a contract as provided, the award may be annulled and the contract let to the next lowest bidder who is reliable, responsible, and responsive in the opinion of the City Commission, and that bidder shall fulfill every stipulation and obligation as if such bidder were the original party to whom award was made.

The contract shall provide that the Contractor agrees to correct any defective or faulty work or material, which may appear within one (1) year after completion of the work and receipt of final payment.

ENFORCEMENT OF SPECIFICATIONS - Copies of the specifications will be placed in the hands of all the assistants to the Engineer and Inspectors employed on the work, who shall enforce each and every requirement of the contract. Such assistants shall have no authority to vary from such requirements.

COPIES OF DRAWING PLANS - Copies of the drawing plans are on file in the Public Works Department, City Hall, 4th Floor, 100 N. Andrews Avenue, Fort Lauderdale, Florida 33301.

SURETY BOND – The Contractor shall execute and record in the public records of Broward County, Florida, a payment and performance bond in an amount at least equal to the Contract Price with a surety insurer authorized to do business in the State of Florida as surety, ("Bond"), in accordance with Section 255.05, Florida Statutes (2018), as may be amended or revised, as security for the faithful performance and payment of all of the Contractor's obligations under the Contract Documents.

The successful bidder shall furnish a performance and payment bond in compliance with Section 255.05, Florida Statutes, written by a Corporate Surety company, holding a Certificate of Authority from the Secretary of the Treasury of the United States as acceptable sureties on federal bonds, in an amount equal to the total amount payable by the terms of the contract, executed and issued by a Resident Agent licensed by and having an office in the State of Florida, representing such Corporate Surety, conditioned for the due and faithful performance of the work, and providing in addition to all other conditions, that if the Contractor, or his or its subcontractors, fail to duly pay for any labor, materials, or other supplies used or consumed by such Contractor, or his or its subcontractor or subcontractors, in performance of the work contracted to be done, the Surety will pay the same in the amount not exceeding the sum provided in such bonds, together with interest at the rate of fifteen percent (15%) per annum, and that they shall indemnify and save harmless the City of Fort Lauderdale to the extent of any and all payments in connection with carrying out of the contract, which the City may be required to make under the law.

The Contractor is required at all times to have a valid surety bond in force covering the work being performed. A failure to have such bond in force at any time shall constitute a default on the part of the Contractor. A bond written by a surety, which becomes disqualified to do business in the State of Florida, shall automatically constitute a failure on the part of the Contractor to meet the above requirements.

Such bond shall continue in effect for one (1) year after completion and acceptance of the work with liability equal to at least twenty-five percent (25%) of contract price, or an additional bond shall be conditioned that the Contractor will correct any defective or faulty work or material which appear within one (1) year after completion of the contract, upon notification by the City, except in contracts which are concerned solely with demolition work, in which cases twenty-five percent (25%) liability will not be applicable.

AUDIT OF CONTRACTOR'S RECORDS - Upon execution of the Contract, the City reserves the right to conduct any necessary audit of the Contractor's records. Such an audit, or audits, may be conducted by the City or its representatives at any time prior to final payment, or thereafter, for a period up to three (3) years. The City may also require submittal of the records from either the Contractor, the Subcontractor, or both. For the purpose of this Section, records shall include all books of account, supporting documents and papers deemed necessary by the City to assure compliance with the contract provisions.

Failure of the Contractor or Subcontractor to comply with these requirements may result in disqualification or suspension from bidding for future contracts or disapproval as a Subcontractor at the option of the City.

The Contractor shall assure that each of its Subcontractors will provide access to its records pertaining to the project upon request by the City.

PERIODIC ESTIMATE FOR PARTIAL PAYMENT - After the Contractor has submitted a periodic estimate for partial payment, approved and certified by the Public Works Department, the City shall make payment in the manner provided in the Contract Documents and in accordance with Florida's Prompt Payment Act, Section 218, Florida Statutes.

RESERVATION FOR AWARD AND REJECTION OF BIDS - The City reserves the right to accept or reject any or all bids, part of bids, and to waive minor irregularities or variations to specifications contained in bids, and minor irregularities in the bidding process. The City also reserves the right to award the contract on a split order basis, lump sum basis, individual item basis, or such combination as shall best serve the interest of the City. The City reserves the right to make an award to the responsive and responsible bidder whose product or service meets the terms, conditions, and specifications of the ITB and whose bid is considered to best serve the City's interest. In determining the responsiveness of the offer and the responsibility of the Bidder, the following shall be considered when applicable: the ability, capacity and skill of the Bidder to perform as required; whether the Bidder can perform promptly, or within the time specified, without delay or interference; the character, integrity, reputation, judgment, experience and efficiency of the Bidder; the quality of past performance by the Bidder; the previous and existing compliance by the Bidder with related laws and ordinances; the sufficiency of the Bidder's financial resources; the availability, quality and adaptability of the Bidder's supplies or services to the required use; the ability of the Bidder to provide future maintenance, service or parts; the number and scope of conditions attached to the bid.

MINORITY AND WOMEN BUSINESS ENTERPRISE PARTICIPATION AND BUSINESS - It is the desire of the City of Fort Lauderdale to increase the participation of minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the City does not have any preference or set aside programs in place, it is committed **to a policy of equitable participation for these firms.** The City of Fort Lauderdale wants to increase the participation of Minority Business Enterprises (MBE), Women Business Enterprises (WBE), and Small Business Enterprises (SBE) in its procurement activities. If your firm qualifies in accordance with the below definitions please indicate in the space provided in this ITB.

Minority Business Enterprise (MBE) "A Minority Business" is a business enterprise that is owned or controlled by one or more socially or economically disadvantaged persons. Such disadvantage may arise from cultural, racial, chronic economic circumstances or background or other similar cause. Such persons include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

The term “Minority Business Enterprise” means a business at least fifty-one percent (51%) of which is owned by minority group members or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by minority group members. For the purpose of the preceding sentence, minority group members are citizens of the United States who include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

Women Business Enterprise (WBE) a “Women Owned or Controlled Business” is a business enterprise at least fifty-one percent (51%) of which is owned by females or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by females.

Small Business Enterprise (SBE) “Small Business” means a corporation, partnership, sole proprietorship, or other legal entity formed for the purpose of making a profit, which is independently owned and operated, has either fewer than 100 employees or less than $1,000,000 in annual gross receipts.

BLACK includes persons having origins in any of the Black racial groups of Africa.

WHITE includes persons whose origins are Anglo-Saxon and Europeans and persons of Indo-European decent including Pakistani and East Indian.

HISPANIC includes persons of Mexican, Puerto Rican, Cuban, Central and South American, or other Spanish culture or origin, regardless of race.

NATIVE AMERICAN includes persons whose origins are American Indians, Eskimos, Aleuts, or Native Hawaiians.

ASIAN AMERICAN includes persons having origin in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.

DEBARRED OR SUSPENDED BIDDERS OR PROPOSERS - The bidder or proposer certifies, by submission of a response to this solicitation, that neither it nor its principals and subcontractors are presently debarred or suspended by any Federal department or agency.

LOBBYING ACTIVITIES - **ALL CONTRACTORS PLEASE NOTE:** Any contractor submitting a response to this solicitation must comply, if applicable, with City of Fort Lauderdale Ordinance No. C-00-27 & Resolution No. 07-101, Lobbying Activities. Copies of Ordinance No., C-00-27, and Resolution No. 07-101, may be obtained from the City Clerk’s Office on the 7th Floor of City Hall, 100 N. Andrews Avenue, Fort Lauderdale, Florida. The ordinance may also be viewed on the City's website at http://www.fortlauderdale.gov/clerk/LobbyistDocs/lobbyist_ordinance.pdf .

Project 12089

SPECIAL CONDITIONS

01. PURPOSE

The City of Fort Lauderdale, Florida (City) is seeking bids from qualified bidders, hereinafter referred to as the Contractor, to provide construction services for the City's Public Works Department, in accordance with the terms, conditions, and specifications contained in this Invitation To Bid (ITB).

This project is located at Coconut Isle Drive over Grande Canal, Bridge No. 865732, in the City of Fort Lauderdale. The work to be accomplished under this contract includes, but is not limited to, removal of existing bridge, construction of new bridge, seawall construction, maintenance of traffic, utility relocation, and roadway construction.

02. TRANSACTION FEES

The City of Fort Lauderdale uses BidSync (www.bidsync.com) to distribute and receive bids and proposals. There is no charge to vendors/contractors to register and participate in the solicitation process, nor will any fees be charged to the awarded contractor.

03. SUBMISSION OF BIDS

It is the sole responsibility of the Contractor to ensure that their bid is submitted electronically through BidSync at www.bidsync.com and that any bid security not submitted via BidSync reaches the City of Fort Lauderdale, Procurement Services Division, 6th floor, Room 619, 100 N. Andrews Avenue, Fort Lauderdale, FL 33301, in a sealed envelope marked on the outside with the ITB solicitation number and Contractor's name, no later than the time and date specified in this solicitation. **PAPER BID SUBMITALS WILL NOT BE ACCEPTED. PLEASE SUBMIT YOUR BID RESPONSE ELECTRONICALLY.**

04. INFORMATION OR CLARIFICATION

For information concerning procedures for responding to this solicitation, contact **Ginah Joseph, Procurement Specialist II**, at **(954) 828-4797** or email at **gjoseph@fortlauderdale.gov**. Such contact shall be for clarification purposes only.

For information concerning technical specifications please utilize the question/answer feature provided by BidSync at www.bidsync.com. Questions of a material nature must be received prior to the cut-off date specified in the solicitation. Material changes, if any, to the scope of services or bidding procedures will only be transmitted by written addendum. (See addendum section of BidSync Site). **Contractors please note**: No part of your bid can be submitted via FAX. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a bid will be considered evidence that the Contractor has familiarized himself with the nature and extent of the work, and the equipment, materials, and labor required. The entire bid response must be submitted in accordance with all specifications contained in this solicitation. The questions and answers submitted in BidSync shall become part of any contract that is created from this ITB.

05. CONTRACT TIME

5.1 The Contractor recognizes that TIME IS OF THE ESSENCE. The Work shall commence within **15** calendar days of the date of the Notice to Proceed.

5.2 The Work shall be Substantially Completed within **300** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

5.3 The Work shall be finally completed on the Final Completion Date and ready for final payment in accordance with this Agreement within **365** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

The City of Fort Lauderdale reserves the right to waive any informality in any bid and to reject any or all bids. The City of Fort Lauderdale reserves the right to reduce or delete any of the bid items.

At time of award of contract, the City reserves the right to set a maximum dollar limit that may be expended on this project. Contract quantities of any or all items may be increased, reduced, or eliminated to adjust the contract amount to coincide with the amount of work necessary or to bring the contract value to within the established limit. All quantities are estimated and the City reserves the right to increase, reduce, or eliminate the contract quantities in any amount.

The undersigned bidder affirms that he has or will obtain all equipment necessary to complete the work described, that he has or will obtain all required permits and licenses from the appropriate agencies, and that his firm is authorized to do business in the State of Florida

06. BID SECURITY

A certified check, cashier's check, bank officer's check or bid bond for **FIVE** percent **(5%)** of the bid amount, made payable to the City of Fort Lauderdale, Florida, shall accompany each proposal.

07. REQUIRED LICENSES/CERTIFICATIONS

Contractor must possess the following licenses/certifications to be considered for award.

Certified General Contractor in the State of Florida

Contractors must be prequalified with the Florida Department of Transportation in compliance with Chapter 337.14 F.S. and Chapter 14-22 - Contractors Highway Qualification To Bid of the Florida Administrative Code (F.A.C) in the following classes:
14-22.003(3)(b) 2,3,7,8,11,12,15,27,40, F.A.C (further delineated below):

14-22.003 Rating the Applicant, (3) Classification of Work, (b) The major classes of work –

- 2. Bridge Deck Overlays,
- 3. Debris Removal
- 7. Drainage
- 8. Electrical Work
- 11. Grading
- 12. Grassing, Seeding and Sodding
- 15. Hot Plant-mixed Bitum. Courses
- 27. Minor Bridges
- 40. Other Work Classes Requested - Pile Driving

Note: Contractor must have proper licensing and be able to provide evidence of same, if requested, at time of award.

Project 12089

08. SPECIFIC EXPERIENCE REQUIRED

The following expertise is required to be considered for this contract. Specific references attesting to this expertise must be submitted with bid.

The contractor shall have at least five (5) years previous construction experience in constructing additions/modifications to existing public buildings in the State of Florida.

Bidder shall submit proof of construction experience for a minimum of three (3) projects of similar scope and scale (or larger) and shall, for each project listed, identify location; dates of construction; project name and overall scope; scope of work that was self-performed by Contractor; and client's name, address, telephone number and e-mail address.

NOTE: REFERENCES SHALL NOT INCLUDE ONLY CITY OF FORT LAUDERDALE EMPLOYEES OR WORK PERFORMED FOR THE CITY. THE CITY IS ALSO INTERESTED IN WORK EXPERIENCE AND REFERENCES FROM ENTITIES OTHER THAN THE CITY OF FORT LAUDERDALE.

By signing this bid solicitation, contractor is affirming that this expertise will be provided for this contract at no additional charge.

09. BID ALLOWANCE

Allowance for permits: Payments will be made to the contractor based on the actual cost of permits upon submission of paid permit receipts. The City shall not pay for other costs related to obtaining or securing permits.

The amount indicated is intended to be sufficient to cover the entire project. If the City Permit fees exceed the allowance indicated, the City will reimburse the contractor the actual amount of City Permit Fees required for project completion.

Allowance	$
FPL, AT&T allowance	8,000
Permit fee allowance	4,000
TOTAL	**12,000**

Note: The City will add this allowance to your bid.

10. INSURANCE REQUIREMENTS *(See Article 10, Bonds and Insurance, of the Contract for details)*

Insurance

10.1 As a condition precedent to the effectiveness of this Agreement, during the term of this Agreement and during any renewal or extension term of this Agreement, the Contractor, at the Contractor's sole expense, shall provide insurance of such types and with such terms and limits as noted below. Providing proof of and maintaining adequate insurance coverage are material obligations of the Contractor. The Contractor shall provide the City a certificate of insurance evidencing such coverage. The Contractor's insurance coverage shall be primary insurance for all applicable policies. The limits of coverage under each policy maintained by the Contractor shall not be interpreted as limiting the Contractor's liability and obligations under this

Agreement. All insurance policies shall be from insurers authorized to write insurance policies in the State of Florida and that possess an A.M. Best rating of A-, VII or better. All insurance policies are subject to approval by the City's Risk Manager.

The coverages, limits, and endorsements required herein protect the interests of the City, and these coverages, limits, and endorsements may not be relied upon by the Contractor for assessing the extent or determining appropriate types and limits of coverage to protect the Contractor against any loss exposure, whether as a result of this Agreement or otherwise. The requirements contained herein, as well as the City's review or acknowledgement, are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under this Agreement.

The following insurance policies and coverages are required:

10.1.1 Commercial General Liability

Coverage must be afforded under a Commercial General Liability policy with limits not less than:

- $1,000,000 each occurrence and $2,000,000 aggregate for Bodily Injury, Property Damage, and Personal and Advertising Injury
- $1,000,000 each occurrence and $2,000,000 aggregate for Products and Completed Operations

Policy must include coverage for Contractual Liability and Independent Contractors.

The City and the City's officers, employees, and volunteers are to be covered as additional insureds with a CG 20 26 04 13 Additional Insured – Designated Person or Organization Endorsement or similar endorsement providing equal or broader Additional Insured Coverage with respect to liability arising out of activities performed by or on behalf of the Contractor. The coverage shall contain no special limitation on the scope of protection afforded to the City or the City's officers, employees, and volunteers.

10.1.2 Business Automobile Liability

Coverage must be afforded for all Owned, Hired, Scheduled, and Non-Owned vehicles for Bodily Injury and Property Damage in an amount not less than $1,000,000 combined single limit each accident.

If the Contractor does not own vehicles, the Contractor shall maintain coverage for Hired and Non-Owned Auto Liability, which may be satisfied by way of endorsement to the Commercial General Liability policy or separate Business Auto Liability policy

10.1.3 Workers' Compensation and Employer's Liability

Coverage must be afforded per Chapter 440, Florida Statutes. Any person or entity performing work for or on behalf of the City must provide Workers' Compensation insurance. Exceptions and exemptions will be allowed by the City's Risk Manager, if they are in accordance with Florida Statute.

The Contractor waives, and the Contractor shall ensure that the Contractor's insurance carrier waives, all subrogation rights against the City and the City's officers, employees, and volunteers for all losses or damages. The City requires the policy to be endorsed with WC 00 03 13 Waiver of our Right to Recover from Others or equivalent.

The Contractor must be in compliance with all applicable State and federal workers' compensation laws, including the U.S. Longshore Harbor Workers' Act and the Jones Act, if applicable.

Insurance Certificate Requirements

a. The Contractor shall provide the City with valid Certificates of Insurance (binders are unacceptable) no later than thirty (30) days prior to the start of work contemplated in this Agreement.
b. The Contractor shall provide to the City a Certificate of Insurance having a thirty (30) day notice of cancellation; ten (10) days' notice if cancellation is for nonpayment of premium.
c. In the event that the insurer is unable to accommodate the cancellation notice requirement, it shall be the responsibility of the Contractor to provide the proper notice. Such notification will be in writing by registered mail, return receipt requested, and addressed to the certificate holder.
d. In the event the Agreement term goes beyond the expiration date of the insurance policy, the Contractor shall provide the City with an updated Certificate of Insurance no later than ten (10) days prior to the expiration of the insurance currently in effect. The City reserves the right to suspend the Agreement until this requirement is met.
e. The Certificate of Insurance shall indicate whether coverage is provided under a claims-made or occurrence form. If any coverage is provided on a claims-made form, the Certificate of Insurance must show a retroactive date, which shall be the effective date of the initial contract or prior.
f. The City shall be named as an Additional Insured on all liability policies, with the exception of Workers' Compensation.
g. The City shall be granted a Waiver of Subrogation on the Contractor's Workers' Compensation insurance policy.
h. The title of the Agreement, Bid/Contract number, event dates, or other identifying reference must be listed on the Certificate of Insurance.

The Certificate Holder should read as follows:
City of Fort Lauderdale
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

The Contractor has the sole responsibility for the payment of all insurance premiums and shall be fully and solely responsible for any costs or expenses as a result of a coverage deductible, co-insurance penalty, or self-insured retention; including any loss not covered because of the operation of such deductible, co-insurance penalty, self-insured retention, or coverage exclusion or limitation. Any costs for adding the City as an Additional Insured shall be at the Contractor's expense.

If the Contractor's primary insurance policy/policies do not meet the minimum requirements, as set forth in this Agreement, the Contractor may provide evidence of an Umbrella/Excess insurance policy to comply with this requirement.

The Contractor's insurance coverage shall be primary insurance as applied to the City and the City's officers, employees, and volunteers. Any insurance or self-insurance maintained by the City covering the City, the City's officers, employees, or volunteers shall be non-contributory.

Any exclusion or provision in the insurance maintained by the Contractor that excludes coverage for work contemplated in this Agreement shall be unacceptable and shall be considered breach of contract.

All required insurance policies must be maintained until the contract work has been accepted by the City, or until this Agreement is terminated, whichever is later. Any lapse in coverage shall be considered breach of contract. In addition, Contractor must provide to the City confirmation of coverage renewal via an updated certificate should any policies expire prior to the expiration of this

Agreement. The City reserves the right to review, at any time, coverage forms and limits of Contractor's insurance policies.

The Contractor shall provide notice of any and all claims, accidents, and any other occurrences associated with this Agreement shall be provided to the Contractor's insurance company or companies and the City's Risk Management office as soon as practical.

It is the Contractor's responsibility to ensure that any and all of the Contractor's independent contractors and subcontractors comply with these insurance requirements. All coverages for independent contractors and subcontractors shall be subject to all of the applicable requirements stated herein. Any and all deficiencies are the responsibility of the Contractor.

10.1.4 ADDITIONAL COVERAGES (for specialty contracts as determined by Risk Management)

10.1.4.1 Crane and Rigging Liability

Coverage must be afforded for any crane operations under the Commercial General or Business Automobile Liability policy as necessary, in line with the limits of the associated policy.

10.1.4.2 Marine Liability including Hull/Protection & Indemnity

The Contract should provide marine liability including hull/protection indemnity with a $1,000,000 Combined Single Limit.

Contractor must keep insurance in force until the third anniversary of expiration of this Agreement or the third anniversary of acceptance of work by the City.

10.1.4.3 Property Coverage (Builder's Risk)

Coverage must be afforded in an amount not less than 100% of the total project cost, including soft costs, with a deductible of no more than $25,000 each claim. Coverage form shall include, but not be limited to:

- All Risk Coverage including Flood and Windstorm with no coinsurance clause
- Guaranteed policy extension provision
- Waiver of Occupancy Clause Endorsement, which will enable the City to occupy the facility under construction/renovation during the activity
- Storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project
- Equipment Breakdown for cold testing of all mechanized, pressurized, or electrical equipment

This policy shall insure the interests of the owner, contractor, and subcontractors in the property against all risk of physical loss and damage, and name the City as a loss payee. This insurance shall remain in effect until the work is completed and the property has been accepted by the City.

10.1.4.4 Watercraft Liability

Coverage must be afforded in an amount not less than $1,000,000 per occurrence and must cover the utilization of watercraft, including Bodily Injury and Property Damage arising out of ownership, maintenance, or use of any watercraft, including owned, non-owned, and hired.

Coverage may be provided in the form of an endorsement to the Commercial General Liability policy, or in the form of a separate policy covering Watercraft Liability or Protection and Indemnity for Bodily Injury and Property Damage.

NOTE: CITY PROJECT NUMBER AND NAME MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORTLAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED" ON ALL LIABILITY POLICIES, WITH THE EXCEPTION OF WORKERS' COMPENSATION.

A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the insurance companies' names for all required coverage, and the dollar amounts of the coverage.

11. PERFORMANCE AND PAYMENT BOND: 100%
Number of awards anticipated: 1

The City may award up to (1) Contract(s) to responsive and responsible contractors providing the lowest bid amounts in sequential order. The selected contractors will receive Task Orders during the effective term of the contract. Each Task Order shall require Surety bonds equal to 100% of the Task Order total. (See complete Performance bond requirements under Article 10 of the Sample Agreement.

12. CITY PROJECT MANAGER

The Project Manager is hereby designated by the City as **Connie Hayman** whose address is 100 North Andrews, 4th Floor, Fort Lauderdale, FL 33301, telephone number: **(954) 828-7150**, and email address is **chayman@fortlauderdale.gov**. The Project Manager will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the Contract Documents in connection with completion of the Work in accordance with this Agreement.

13. LIQUIDATED DAMAGES *(See Article 16, Liquidated Damages, of the Contract for details)*

Upon failure of the Contractor to complete the Work within the time specified for completion, the Contractor shall pay to the City the sum of **Five Hundred Dollars ($500.00)** for each and every calendar day that the completion of the Work is delayed beyond the time specified in this Agreement for completion, as fixed and agreed liquidated damages and not as a penalty, so long as the delay is caused by the Contractor. (See Article 16, Liquidated Damages Clause, of the Contract)

14. PAYMENT (*See Article 7, Payment, of the Contract for other details*)

The City has implemented a Purchasing Card (P-Card) Program utilizing both VISA and MASTERCARD networks. Purchases from this contract will be made utilizing the City's Purchasing Card. Contractor will receive payment from the purchasing card in the same manner as other credit card purchases. Accordingly, bidders must presently have the ability to accept these credit cards or take whatever steps necessary to implement the ability before the start of the contract term, or contract award by the City. The City reserves the right to revise this program as necessary.

Project 12089

15. WORK SCHEDULE (including overtime hours):

Regular work hours: **8:00 am to 5:00 pm, Monday through Friday.**
City Inspector Hours: **8:00 am to 4:30 pm, Monday through Friday.**

Any inspection requested by the contractor outside those hours will be considered overtime to be paid by the Contractor.

16. INSPECTION OVERTIME COST: $146/hour

CITY OF FORT LAUDERDALE
CONSTRUCTION AGREEMENT

THIS AGREEMENT made and entered into this _____ day of _____, 20__, by and between the City of Fort Lauderdale, a Florida municipal corporation (City) and _____, (Contractor), (parties);

WHEREAS, the City desires to retain a contractor for the Project as expressed in its Invitation to Bid No., _____, Project Number, _____, which was opened on _____; and,

WHEREAS, the Contractor has expressed its willingness and capability to perform the necessary work to accomplish the Project.

NOW, THEREFORE, the City and the Contractor, in consideration of the mutual covenants and conditions contained herein and for other good and valuable consideration, the receipt and sufficiency is hereby acknowledged, agree as follows:

ARTICLE 1 – DEFINITIONS

Whenever used in this Agreement or in other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural forms:

1.1 Agreement – This written Agreement between the City and the Contractor covering the work to be performed including other Contract Documents that are attached to or incorporated in the Agreement.

1.2 Application for Payment – The form accepted by the City which is to be used by the Contractor in requesting progress or final payment and which is to include such supporting documentation as is required by the Contract Documents

1.3 Approve – The word approve is defined to mean review of the material, equipment or methods for general compliance with design concepts and with the information given in the Contract Documents. It does not imply a responsibility on the part of the City to verify in every detail conformance with plans and specifications.

1.4 Bid – The offer or Bid of the Contractor submitted on the prescribed form setting forth the total prices for the Work to be performed.

1.5 Bid Documents –This Agreement, advertisement for Invitation to Bids, the Instructions to Bidders, the Bid Form (with supplemental affidavits and agreements), the Contract Forms, General Conditions, the Supplementary Conditions, the Specifications, and the Plans, which documents all become an integral part of the Contract Documents.

1.6 Certificate of Substantial Completion - Certificate provided by the City certifying that all Work, excluding the punch list items, has been completed, inspected, and accepted by the City.

1.7 Change Order - A change order is defined as a written order to a contractor approved by the City, authorizing a revision of an underlying agreement between the City and a contractor that is directly related to the original scope of work or an adjustment in the original contract price or the contract time directly related to the original scope of work, issued on or after the effective date of the contract.

1.8 City – The City of Fort Lauderdale, Florida, including but not limited to its employees, agents, officials, representatives, contractors, subcontractors, volunteers, successors and assigns, with whom the Contractor has entered into the Agreement and for whom the Work is to be provided.

1.9 Contract Documents – The Contract Documents shall consist of this Agreement, Exhibits to this Agreement, Public Construction Bond, Performance Bond, Payment Bond and Certificates of Insurance, Notice of Award and Notice to Proceed, General Conditions as amended by the Special Conditions, Technical Specifications, Plans/Drawings, Addenda, Bid Form and supplement Affidavits and Agreements, all applicable provisions of State and Federal Law and any modification, including Change Orders or written amendments duly delivered after execution of Agreement, Invitation to Bid, Instructions to Bidders and Bid Bond, Contractor's response to the City's Invitation to Bid, Schedule of Completion, Schedule of Values, all amendments, modifications and supplements, change orders and work directive changes issued on or after the Effective Date of the Agreement, as well as any additional documents that are required to be submitted under the Agreement.

Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Agreement. A copy of all permits shall be given to the City for inclusion in the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

1.10 Contract Price – The monies payable to the Contractor by the City under the Contract Documents and in accordance with the line item unit prices listed in the Bid.

1.11 Contract Time – The number of calendar days stated in the Agreement for the completion of the Work. The dates on which the work shall be started and shall be completed as stated in the Notice to Proceed.

1.12 Contractor – The person, firm, company, or corporation with whom the City has entered into the Agreement, including but not limited to its employees, agents, representatives, contractors, subcontractors, their subcontractors and their other successors and assigns.

1.13 Day – A calendar day of twenty-four (24) hours ending at midnight.

1.14 Defective – An adjective which when modifying the word "Work" refers to work that is unsatisfactory, faulty, or deficient, or does not conform to the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in the Contract Documents, or has been damaged prior to the Project Manager's recommendation of final payment.

1.15 Effective Date of the Agreement – The effective date of the agreement shall be the date the City Commission approves the work. The contractor shall provide all required payment and performance bonds and insurances to the City within ten (10) Calendar days following the City Commission approval. Upon verification of all bonds and insurances, the City will issue a notice to proceed (NTP) to the Contractor. Contract time will commence on the date when the Notice to Proceed is issued. The Contractor shall commence the work immediately upon receipt of the Notice to Proceed. Failure of the contractor to proceed with the work will constitute non-performance of the Contractor and would be ground for termination of the contract per ARTICLE 17 of the Agreement.

1.16 Final Completion Date – The date the Work is completed, including completion of the final punch list, and delivered along with those items specified in the Contract Documents and is accepted by the City.

1.17 Hazardous Materials (HAZMAT) - Any solid, liquid, or gaseous material that is toxic, flammable, radioactive, corrosive, chemically reactive, or unstable upon prolonged storage in quantities that could pose a threat to life, property, or the environment defined in Section 101(14) of Comprehensive Environmental Response, Compensation and Liability Act of 1980 and in 40 CFR 300.6. Also defined by 49 CFR 171.8 as a substance or material designated by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated.

1.18 Hazardous Substance - As defined by Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act; any substance designated pursuant to Section 311(b) (2) (A) of the Clean Water Act; any element, compound, mixture, solution or substance designated pursuant to Section 102 identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act {but not including any waste listed under Section 307[a] of the Clean Water Act}; any hazardous air pollutant listed under Section 112 of the Clean Air Act; and any imminently hazardous chemical substance or mixture pursuant to Section 7 of the Toxic Substances Control Act. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance in the first sentence of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

1.19 Hazardous Waste - Those solid wastes designated by OSHA in accordance with 40 CFR 261 due to the properties of ignitability, corrosivity, reactivity, or toxicity. Any material that is subject to the Hazardous Waste Manifest requirements of the EPA specified in 40 CFR Part 262.

1.20 Holidays - Those designated non-work days as established by the City Commission of the City of Fort Lauderdale.

1.21 Inspection – The term “inspection” and the act of inspecting as used in this Agreement is defined to mean the examination of construction to ensure that it conforms to the design concept expressed in the plans and specifications. This term shall not be construed to mean supervision, superintending and/or overseeing.

1.22 Notice of Award - The written notice by City to the Contractor stating that upon compliance by the Contractor with the conditions precedent enumerated therein, within the time specified that the City will sign and deliver this Agreement.

1.23 Notice to Proceed – A written notice given by the City to the Contractor fixing the date on which the Contract Time will commence to run and on which the Contract Time will end.

1.24 Plans - The drawings which show the character and scope of the work to be performed and which have been prepared or approved by the City and are referred to in the Contract Documents.

1.25 Premises (otherwise known as Site or Work Site) – means the land, buildings, facilities, etc. upon which the Work is to be performed.

1.26 Project – The total construction of the Work to be provided as defined in the Contract Documents.

1.27 Project Manager - The employee of the City, or other designated individual who is herein referred to as the Project Manager, will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the contract Documents in connection with completion of the Work in accordance with this Agreement. The Project Manager, or designee, shall be the authorized agent for the City unless otherwise specified.

1.28 Punch List - The City's list of Work yet to be done or be corrected by the Contractor, before the Final Completion date can be determined by the City.

1.29 Record Documents - A complete set of all specifications, drawings, addenda, modifications, shop drawings, submittals and samples annotated to show all changes made during the construction process.

1.30 Record Drawings or "As-Builts" - A set of drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor. These documents will be signed and sealed by the Engineer of Record or a Professional Land Surveyor licensed in the State of Florida.

1.31 Substantially Completed Date – A date when the Contractor has requested in writing, stating that the Work is substantially completed and is ready for an inspection and issuance of a final punch list for the Project.

1.32 Work – The entire completed delivered product or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating material and equipment into the product, all as required by the Contract Documents.

ARTICLE 2 – SCOPE OF WORK

2.1 The Contractor shall complete all work as specified or indicated in the Contract Documents. The Project for which the Work under the Contract Documents may be the whole or only part is generally described as follows:

Coconut Bridge Isle Replacement
ITB 12201-293 PROJECT 12089

2.2 All Work for the Project shall be constructed in accordance with the Drawings and Specifications. The Work generally involves:

PROJECT DESCRIPTION

This project is located at Coconut Isle Drive over Grande Canal in the City of Fort Lauderdale. The work to be accomplished under this contract includes, but is not limited to, removal of existing bridge, construction of new bridge, seawall construction, maintenance of traffic, utility relocation, and roadway construction.

2.3 Within ten (10) days of the execution of this Agreement, the Contractor shall submit a Construction Schedule, Schedule of Values and a listing of those subcontractors that will be utilized by the Contractor. The general sequence of the work shall be submitted by the Contractor and approved by the City before any work commences. The City reserves the right to issue construction directives necessary to facilitate the Work or to minimize any conflict with operations.

ARTICLE 3 – PROJECT MANAGER

3.1 The Project Manager is hereby designated by the City as Connie Hayman, whose address is 100 N. Andrews Avenue, 4th Floor, Fort Lauderdale, FL 33301, telephone number: (954) 828-7150, and email address is CHayman@fortlauderdale.gov. The Project Manager will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the Contract Documents in connection with completion of the Work in accordance with this Agreement.

ARTICLE 4 – CONTRACT DOCUMENTS

The Contract Documents which comprise the entire Agreement between the City and Contractor are attached to this Agreement, are made a part hereof and consist of the following:

4.1 This Agreement.

4.2 The Contract Documents may only be altered, amended, or repealed in accordance with the specific provisions of the terms of this Agreement.

4.3 Exhibits to this Agreement: (Plans sheets [ ] to [ ] inclusive).

4.4 Public Construction Bond, Performance Bond, Payment Bond and Certificates of Insurance.

4.5 Notice of Award and Notice to Proceed.

4.6 General Conditions as amended by the Special Conditions.

4.7 Technical Specifications.

4.8 Plans/Drawings.

4.9 Addenda number _____ through _____, inclusive.

4.10 Bid Form and supplement Affidavits and Agreements.

4.11 All applicable provisions of State and Federal Law.

4.12 Invitation to Bid No., _____, Instructions to Bidders, and Bid Bond.

4.13 Contractor's response to the City's Invitation to Bid No., _____, dated _____.

4.14 Schedule of Completion and Schedule of Values.

4.15 All amendments, modifications and supplements, change orders and work directive changes issued on or after the Effective Date of the Agreement.

4.16 Any additional documents that are required to be submitted under the Agreement.

4.17 Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Agreement. A copy of all permits shall be given to the City for inclusion in the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

In the event of any conflict between the documents or any ambiguity or missing specification or instruction, the following priority is established:

a. Specific direction from the City Manager (or designee).

b. Approved change orders, addenda or amendments.

c. Specifications (quality) and Drawings (location and quantity).

d. Supplemental conditions or special terms.

e. General Terms and Conditions.

f. This Agreement dated _____ and any attachments.

g. Invitation to Bid No., _____, and the specifications prepared by the City.

h. Contractor's response to the City's Invitation to Bid No., _____, dated _____.

i. Schedule of Values.

j. Schedule of Completion.

If during the performance of the Work, Contractor finds a conflict, error or discrepancy in the Contract Documents, Contractor shall so report to the Project Manager, in writing, at once and before proceeding with the Work affected shall obtain a written interpretation or clarification from the City.

It is the intent of the specifications and plans to describe a complete Project to be constructed in accordance with the Contract Documents. Any Work that may reasonably be inferred from the specifications or plans as being required to produce the intended result shall be supplied whether or not it is specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such works shall be interpreted in accordance with such meaning. Reference to standard specifications, manuals or codes of any technical society, organization or associations, or to the code of any governmental authority whether such reference be specific or implied, shall mean the latest standard specification, manual or code in effect as of the Effective Date of this Agreement, 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 change the duties and responsibilities of the City, the Contractor, or any of their agents or employees from those set forth in the Contract Documents.

ARTICLE 5 – CONTRACT TIME

5.1 The Contractor recognizes that **TIME IS OF THE ESSENCE**. The Work shall commence within **15** calendar days of the date of the Notice to Proceed.

5.2 The Work shall be Substantially Completed within **300** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

5.3 The Work shall be finally completed on the Final Completion Date and ready for final payment in accordance with this Agreement within **365** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

ARTICLE 6 – CONTRACT PRICE

6.1 City shall pay Contractor for performance of the Work in accordance with Article 7, subject to additions and deletions by Change Order, as provided for in this Agreement.

6.2 The parties expressly agree that the Contract Price, which shall not exceed the amount of $_____, constitutes the total maximum compensation payable to Contractor for performing the Work, plus any Work done pursuant to a Change Order. The Contract Price is in accordance with the line item unit prices listed in the Bid. Line items are based on a unit price cost multiplied by a defined quantity. Any

additional duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change to the Contract Price.

6.3 The Contract Price constitutes the compensation payable to Contractor for performing the Work plus any Work done pursuant to a Change Order. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change in the Contract price.

ARTICLE 7 – PAYMENT

7.1 Contractor shall submit Applications for Payment in accordance with the Contract Documents. Applications for Payment will be processed by City as provided in the General Conditions.

7.2 Progress Payments. City shall make progress payments on account of the Contract Price on the basis of Contractor's monthly Applications for Payment, which shall be submitted by the Contractor between the first (1st) and the tenth (10th) day after the end of each calendar month for which payment is requested. All progress payments will be made on the basis of the progress of the Work completed.

7.3 Prior to Final Completion, progress payments will be made in an amount equal to ninety percent (90%) of the value of Work completed less in each case the aggregate of payments previously made.

7.4 Final Payment. Upon final completion of the Work in accordance with the General Conditions, as may be supplemented, the City shall pay Contractor an amount sufficient to increase total payments to one-hundred percent (100%) of the Contract Price. However, not less than ten percent (10%) of the Contract Price shall be retained until Record Drawings (as-builts), specifications, addenda, modifications and shop drawings, including all manufacturers' instructional and parts manuals are delivered to and accepted by the City.

7.5 City may withhold, in whole or in part, payment to such extent as may be necessary to protect itself from loss on account of:

7.5.1 Defective work not remedied.
7.5.2 Claims filed or reasonable evidence indicating probable filing of claims by other parties against Contractor or City because of Contractor's performance.
7.5.3 Failure of Contractor to make payments properly to Subcontractors or for material or labor.
7.5.4 Damage to another contractor not remedied.
7.5.5 Liquidated damages and costs incurred by Consultant for extended construction administration, if applicable.
7.5.6 Failure of Contractor to provide any and all documents required by the Contract Documents.

When the above grounds are removed or resolved satisfactory to the Project Manager, payment shall be made in whole or in part.

7.6 The City shall make payment to the Contractor in accordance with the Florida Prompt Payment Act, Section 218.70, Florida Statutes.

7.7 The City shall make payment to the Contractor through utilization of the City's P-Card Program. The City has implemented a Purchasing Card Program utilizing both VISA and MASTERCARD networks. Purchases made from this Contract shall be made using the City's Purchasing Card. Contractor will receive payment from the purchasing card in the same manner as other credit card purchases. Accordingly, bidders must presently have the ability to accept these credit cards or take whatever steps necessary to implement the ability before the start of the contract term, or contract award by the City. The City reserves the right to revise this program as necessary.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

In order to induce the City to enter into this Agreement, Contractor makes the following representations upon which the City has relied:

8.1 Contractor is qualified in the field of public construction and in particular to perform the Work and services set forth in this Agreement.

8.2 Contractor has visited the Work Site, has conducted extensive tests, examinations and investigations and represents and warrants a thorough familiarization with the nature and extent of the Contract Documents, the Work, locality, soil conditions, moisture conditions and all year-round local weather and climate conditions (past and present), and, in reliance on such tests, examination and investigations conducted by Contractor and the Contractor's experts, has determined that no conditions exist that would in any manner affect the Proposed Price and that the project can be completed for the Proposed Price submitted within the Contract Time as defined in this Agreement. Furthermore, Contractor warrants and confirms that he is totally familiar with, understands and obligates Contractor to comply with all federal, state and local laws, ordinances, rules, regulations and all market conditions that affect or may affect the cost and price of materials and labor needed to fulfill all provisions of this Agreement or that in any manner may affect cost, progress or performance of the Work.

8.3 The Contractor has satisfied itself as to the nature and location of the Work under the Contract Documents, the general and local conditions of the Project, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, and roads, the conformation and conditions at the ground based on City provided reports, the type of equipment and facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under the Contract Documents.

8.4 The Contractor has also studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Works, and finds and has further determined that no conditions exist that would in any manner affect the Proposed Price and that the project can be completed for the Proposed Price submitted.

8.5 Contractor has made or caused to be made examinations, investigations, tests and studies of such reports and related data in addition to those referred to in Paragraphs 8.2, 8.3 and 8.4 above as he deems necessary for the performance of the Work at the Contract Prices, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are, or will be, required by Contractor for such purposes.

8.6 Contractor has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

8.7 Contractor has given City written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution by City is acceptable to the Contractor.

8.8 Labor

8.8.1 The Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The Contractor shall at all times maintain good discipline and order at the site.

8.8.2 The Contractor shall, at all times, have a competent superintendent, capable of reading and thoroughly understanding the drawings and specifications, as the Contractor's agent on the Work, who shall, as the Contractor's agent, supervise, direct and otherwise conduct the Work.

8.8.3 The Contractor shall designate the superintendent on the job to the City, in writing, immediately after receipt of the Notice to Proceed. The Contractor understands and agrees that the superintendent's physical presence on the job site is indispensable to the successful completion of the Work. If the superintendent is frequently absent from the job site, the Project Manager may deliver written notice to the Contractor to stop work or terminate the Contract in accordance with Article 17.

8.8.4 The Contractor shall assign personnel to the job site that have successfully completed training programs related to trench safety, confined space and maintenance of traffic. A certified "competent person" shall be assigned to the job site. Personnel certified by the International Municipal Signal Associations with Florida Department of Transportation qualifications are required relative to maintenance of traffic. Failure to pursue the Work with the properly certified supervisory staff may result in notice to stop work or terminate the Contract in accordance with Article 17.

8.9 Materials:

8.9.1 The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of Work.

8.9.2 All material and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. Suppliers shall be selected and paid by the Contractor; the City reserves the right to approve all suppliers and materials.

8.10 Work Hours: Except in connection with the safety or protection of persons, or the Work, or property at the site or adjacent thereto, and except as otherwise indicated in the Supplementary Conditions, all work at the site shall be performed during regular working hours between 7 a.m. and 6:00 p.m., Monday through Friday. The Contractor will not permit overtime work or the performance of work on Saturday, Sunday or any legal holiday (designated by the City of Fort Lauderdale) without the Project Manager's written consent at least seventy-two (72) hours in advance of starting such work. If the Project Manager permits overtime work, the Contractor shall pay for the additional charges to the City with respect to such overtime work. Such additional charges shall be a subsidiary obligation of the Contractor and no extra payment shall be made to the Contractor for overtime work. It shall be noted that the City's Inspector work hours are from 8:00 a.m. to 4:30 p.m. and any Work requiring inspection oversight being performed outside of this timeframe shall be paid for by the Contractor as Inspector overtime. The cost to the Contractor to reimburse the City for overtime inspection is established at direct-labor and overtime costs for each person or inspector required. Incidental overtime costs for engineering, testing and other related services will also be charged to the Contractor at the actual rate accrued.

8.11 Patent Fee and Royalties: The Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work, or any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. The Contractor hereby expressly binds himself or itself to indemnify and save harmless the City from all such claims and fees and from any and all suits and action of every name and description that may be brought against City on account of any such claims, fees, royalties, or costs for any such invention or patent, and from any and all suits or actions that may be brought against said City for the infringement of any and all patents or patent rights claimed by any person, firm corporation or other entity.

8.12 Permits: The Contractor shall obtain and pay for all permits and licenses. There shall be no allowance for Contractor markup, overhead or profit for permits and licenses. The Contractor shall pay all government charges which are applicable at the time of opening of proposals. It shall be the responsibility of the Contractor to secure and pay for all necessary licenses and permits of a temporary nature necessary for the prosecution of Work.

8.13 Law and Regulations: The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If the Contractor observes that the specifications or plans are at variance therewith, the Contractor shall give the Project Manager prompt written notice thereof, and any necessary changes shall be adjusted by any appropriate modifications. If the Contractor performs any work knowing or having reason to know that it is contrary to such laws, ordinances, rules and regulations, and without such notice to the Project Manager, the Contractor shall bear all costs arising therefrom; however, it shall not be the Contractor's primary responsibility to make certain that the specifications and plans are in accordance with such laws, ordinances, rules and regulations.

8.14 Taxes: The Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by him in accordance with the laws of the City of Fort Lauderdale, County of Broward, State of Florida.

8.15 Contractor Use of Premises: The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workmen to areas permitted by law, ordinances, permits and/or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

The Contractor shall not enter upon private property for any purpose without first securing the permission of the property owner in writing and furnishing the Project Manager with a copy of said permission. This requirement will be strictly enforced, particularly with regard to such vacant properties as may be utilized for storage or staging by the Contractor.

The Contractor shall conduct his work in such a manner as to avoid damage to adjacent private or public property. Any damage to existing structures of work of any kind, including permanent reference markers or property corner markers, or the interruption of a utility service, shall be repaired or restored promptly at no expense to the City or property owner.

The Contractor will preserve and protect all existing vegetation such as trees, shrubs and grass on or adjacent to the site which do not reasonably interfere with the construction, as determined by the Project Manager. The Contractor will be responsible for repairing or replacing any trees, shrubs, lawns and landscaping that may be damaged due to careless operation of equipment, stockpiling of materials, tracking of grass by equipment or other construction activity. The Contractor will be liable for, or will be required to replace or restore at no expense to the City all vegetation not protected or preserved as required herein that may be destroyed or damaged.

During the progress of the work, the Contractor shall keep the premises free from accumulations of waste materials, rubbish and debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials and shall leave the site clean and ready for occupancy by the City. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents at no cost to the City.

8.16 Project Coordination: The Contractor shall provide for the complete coordination of the construction effort. This shall include, but not necessarily be limited to, coordination of the following:

8.16.1 Flow of material and equipment from suppliers.
8.16.2 The interrelated work with affected utility companies.
8.16.3 The interrelated work with the City where tie-ins to existing facilities are required.
8.16.4 The effort of independent testing agencies.
8.16.5 Notice to affected property owners as may be directed by the Project Manager.

8.17 Project Record Documents and Final As-Builts (Record Drawings): Contractor shall be responsible for maintaining up-to-date redline as-built drawings, on site, at all times during construction. All as-built information shall be surveyed and verified by a professional land surveyor registered in the State of Florida. Contractor shall provide the City with a minimum of three (3) sets of signed and sealed record drawings (Final As-Builts) and a CD of the electronic drawings files created in AutoCad 2014 or later. All costs associated with survey work required for construction layout and as-built preparation shall be the responsibility of the Contractor.

8.18 Safety and Protection:

8.18.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

8.18.1.1 All employees working on the project and other persons who may be affected thereby.

8.18.1.2 All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

8.18.1.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

8.18.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and utilities when execution of the Work may affect them at least seventy-two (72) hours in advance (unless otherwise required). All damage, injury or loss to any property caused, directly or indirectly, in whole or in part by the Contractor, any subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by the Contractor. The Contractor's duties and responsibilities for safety and protection of the Work shall continue until such time as all the Work is completed and accepted by the City.

8.19 Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the City is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Project Manager prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby.

8.20 Risk of Loss: The risk of loss, injury or destruction shall be on the Contractor until acceptance of the Work by the City. Title to the Work shall pass to the City upon acceptance of the Work by the City.

8.21 Environmental: The Contractor has fully inspected the Premises and agrees, except as to the presence of any asbestos, to accept the Premises in an "as is" physical condition, without representation or warranty by the City of any kind, including, without limitation, any and all existing environmental claims or obligations that may arise from the presence of any "contamination" on, in or about the Premises. Further, Contractor and all entitles claiming by, through or under the Contractor, releases and discharges the City, from any claim, demand, or cause of action arising out of or relating to the Contractor's use, handling, storage, release, discharge, treatment, removal, transport, decontamination, cleanup, disposal and/or presence of any hazardous substances including asbestos on, under, from or about the Premises. The Contractor shall have no liability for any pre-existing claims or "contamination" on the Premises.

The Contractor shall not use, handle, store, discharge, treat, remove, transport, or dispose of Hazardous Substances including asbestos at, in, upon, under, to or from the Premises until receipt of instructions from the City. At such time, a City approved Change Order, which shall not include any profit, shall authorize the Contractor to perform such services.

The Contractor shall immediately deliver to the Project Manager complete copies of all notices, demands, or other communications received by the Contractor from any governmental or quasi-governmental authority or any insurance company or board of fire underwriters or like or similar entities regarding in any way alleged violations or potential violations of any Environmental Law or otherwise asserting the existence or potential existence of any condition or activity on the Premises which is or could be dangerous to life, limb, property, or the environment.

For other and additional consideration, the Contractor hereby agrees, at its sole cost and expense, to indemnify and protect, defend, and hold harmless the City and its respective employees, agents, officials, officers, representatives, contractors and subcontractors, successors, and assigns (hereafter the "City") from and against any and all claims, demands, losses, damages, costs, expenses, including but not limited to mitigation, restoration, and natural restoration expenses, liabilities, assessments, fines, penalties charges, administrative and judicial proceedings and orders, judgments, causes of action, in law or in equity, remedial action requirements and/or enforcement actions of any kind (including, without limitation, attorneys' fees and costs) directly or indirectly arising out of or attributable to, in whole or in part, the Contractor's use, handling, storage, release, threatened release, discharge, treatment, removal, transport, decontamination, cleanup, disposal and/or presence of a Hazardous Substance (excluding asbestos) on, under, from, to or about the Premises or any other activity carried on or undertaken on or off the Premises by the Contractor or its employees, agents or subcontractors, in connection with the use, handling, storage, release, threatened release, discharge, treatment, mitigation, natural resource restoration, removal, transport, decontamination, cleanup, disposal and/or presence or any Hazardous Substance including asbestos located, transported, or present on, undue, from, to, or about the Premises. This indemnity is intended to be operable under 42 U.S.C. sections 9607, as amended, and any successor section.

The scope of the indemnity obligations includes, but is not limited to: (a) all consequential damages; (b) the cost of any required or necessary repair, cleanup, or detoxification of the applicable real estate and the preparation and implementation of any closure, remedial or other required plan, including without limitation; (i) the costs of

removal or remedial action incurred by the United States government or the State of Florida or response costs incurred by any other person, or damages from injury to destruction of, or loss of, natural resources, including the cost of assessing such injury, destruction, or loss, incurred pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, as amended; (ii) the clean-up costs, fines, damages, or penalties incurred pursuant to any applicable provisions of Florida law; and (iii) the cost and expenses of abatement, correction or cleanup, fines, damages, response costs, or penalties which arise from the provisions of any other statute, law, regulation, code ordinance, or legal requirement state or federal; and (c) liability for personal injury or property damage arising under any statutory or common law tort theory, including damages assessed for the maintenance of a public private nuisance, response costs, or for the carrying on of an abnormally dangerous activity.

8.22 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any other reason or allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

8.23 No Liens: If any Subcontractor, supplier, laborer, or materialmen of Contractor or any other person directly or indirectly acting for or through Contractor files or attempts to file a mechanic's or construction lien against the real property on which the work is performed or any part or against any personal property or improvements or claim against any monies due or to become due from the City to Contractor or from Contractor to a Subcontractor, for or on account of any work, labor, services, material, equipment, or other items furnished in connection with the Work or any Change Order, Contractor agrees to satisfy, remove, or discharge such lien or claim at its own expense by bond, payment, or otherwise within twenty (20) days of the filing or from receipt of written notice from the City.

Additionally, until such time as such lien or claim is satisfied, removed or discharged by Contractor, all monies due to Contractor, or that become due to Contractor before the lien or claim is satisfied, removed or otherwise discharged, shall be held by City as security for the satisfaction, removal and discharge of such lien and any expense that may be incurred while obtaining such. If Contractor shall fail to do so, City shall have the right, in addition to all other rights and remedies provided by this Agreement or by law, to satisfy, remove, or discharge such lien or claim by whatever means City chooses at the entire and sole cost and expense of Contractor which costs and expenses shall, without limitation, include attorney's fees, litigation costs, fees and expenses and all court costs and assessments.

8.24 Weather Emergencies: Upon issuance of a Hurricane Watch by the National Weather Service, the Contractor shall submit to the City a plan to secure the work area in the

event a Hurricane Warning is issued. The plan shall detail how the Contractor will secure the Premises, equipment and materials in a manner as to prevent damage to the Work and prevent materials and equipment from becoming a hazard to persons and property on and around the Premises. The plan shall include a time schedule required to accomplish the hurricane preparations and a list of emergency contacts that will be available and in the City before, during and immediately after the storm.Upon issuance of a Hurricane Warning by the National Weather Service, if the Contractor has not already done so, the Contractor shall implement its hurricane preparedness plan. Cost of development and implementation of the hurricane preparedness plan shall be considered as incidental to construction. Cost of any clean up and rework required after the storm will be considered normal construction risk within Florida and shall not entitle the Contractor to any additional compensation. Contractor shall be entitled to request an extension in time for completion of the Work, in accordance with the provisions of Article 15 of this Agreement, equal to the time he is shut down for implementation of the preparedness plan, the duration of the storm and a reasonable period to restore the Premises.

8.25 Force Majeure: No Party shall hold the other responsible for damages or for delays in performance caused by force majeure, acts of God, or other acts or circumstances beyond the control of the other party or that could not have been reasonably foreseen and prevented. For this purposes, such acts or circumstances shall include, but not be limited to weather conditions affecting performance, floods, epidemics, war, riots, strikes, lockouts, or other industrial disturbances, or protest demonstrations. Should such acts or circumstances occur, the parties shall use their best efforts to overcome the difficulties arising therefrom and to resume the Work as soon as reasonably possible with the normal pursuit of the Work.

Inclement weather, continuous rain for less than three (3) days or the acts or omissions of subcontractors, third-party contractors, materialmen, suppliers, or their subcontractors, shall not be considered acts of force majeure.

No Party shall be liable for its failure to carry out its obligations under the Agreement during a period when such Party is rendered unable by force majeure to carry out its obligation, but the obligation of the Party or Parties relying on such force majeure shall be suspended only during the continuance of the inability and for no longer period than the unexpected or uncontrollable event.

The Contractor further agrees and stipulates, that its right to excuse its failure to perform by reason of force majeure shall be conditioned upon giving written notice of its assertion that a Force Majeure delay has commenced within 96 hours after such an occurrence. The CONTRACTOR shall use its reasonable efforts to minimize such delays. The CONTRACTOR shall promptly provide an estimate of the anticipated additional time required to complete the Project.

8.26 Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assisted Contracts: The recipient shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of any DOT-assisted contract or in the administration of its DBE program or the requirements of 49 CFR part 26. The recipient shall take all necessary and reasonable steps under 49 CFR part 26 to ensure nondiscrimination in the award and administration of DOT-assisted contracts. The recipient's DBE program, as required by 49 CFR part 26 and as

approved by DOT, is incorporated by reference in this agreement. Implementation of this program is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the recipient of its failure to carry out its approved program, the Department may impose sanctions as provided for under part 26 and may, in appropriate cases, refer the matter for enforcement under 18 U.S.C. 1001 and/or the Program Fraud Civil Remedies Act of 1986 (31 U.S.C. 3801 *et eq.*).

Additionally, the contractor assures that they, the sub recipient or the subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. (This additional language must be included in each subcontract the prime contractor signs with a subcontractor.)

ARTICLE 9 – CITY'S RESPONSIBILITIES

9.1 The City shall furnish the data required of the City under the Contract Documents promptly and shall make payments to the Contractor promptly after they are due as provided in Article 7.

9.2 The City's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in the Contract Documents.

9.3 Technical Clarifications and Interpretations:

9.3.1 The City shall issue, with reasonable promptness, such written clarifications or interpretations of the Contract Documents as it may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Should the Contractor fail to request interpretation of questionable items in the Contract Documents, the City shall not entertain any excuse for failure to execute the Work in a satisfactory manner.

9.3.2 The City shall interpret and decide matters concerning performance under the requirements of the Contract Documents, and shall make decisions on all claims, disputes or other matters in question. Written notice of each claim, dispute or other matter will be delivered by claimant to the other Party but in no event later than five (5) days after the occurrence of event, and written supporting date will be submitted to the other Party within five (5) days after such occurrence. All written decisions of the City on any claim or dispute will be final and binding.

9.4 The Contractor shall perform all Work to the reasonable satisfaction of the City in accordance with the Contract Documents. In cases of disagreement or ambiguity, the City shall decide all questions, difficulties, and disputes of whatever nature, which may arise under or by reason of this Agreement or the quality, amount and value of the Work, and the City's decisions on all claims, questions and determination are final.

ARTICLE 10 – BONDS AND INSURANCE

10.1 Public Construction and Other Bonds: The Contractor shall furnish Public Construction or Performance and Payment Bonds ("Bond"), each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all the Contractor's obligations under the Contract Documents. These Bonds shall remain in effect until at least one (1) year after the date of final payment, except as otherwise provided by law. All Bonds shall be furnished and provided by the surety and shall be in substantially the same form as prescribed by the Contract Documents and be executed by such sureties as (i) are licensed to conduct business in the State of Florida, and (ii) are named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department and (iii) otherwise meet the requirements set forth herein that apply to sureties. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

10.1.1 Performance Bond: A Corporate Surety Bond legally issued, meeting the approval of, and running to the City in an amount not less than the Contract Price of such improvements, conditioned that the Contractor shall maintain and make all repairs to the improvements constructed by the Contractor at their own expense and free of charge to the City, for the period of one (1) year after the date of acceptance of the Work within such period by reason of any imperfection of the material used or by reason of any defective workmanship, or any improper, imperfect or defective preparation of the base upon which any such improvement shall be laid.

The Contractor shall execute and record in the public records of Broward County, Florida, a payment and performance bond in an amount at least equal to the Contract Price with a surety insurer authorized to do business in the State of Florida as surety, ("Bond"), in accordance with Section 255.05, Florida Statutes (2014), as may be amended or revised, as security for the faithful performance and payment of all of the Contractor's obligations under the Contract Documents.

10.2 Disqualification of Surety: If the Surety on any Bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the State of Florida or it ceases to meet the requirements of clauses (i) and (ii) of Paragraph 10.1, the Contractor shall within five (5) days thereafter substitute another Bond and Surety, both of which shall be acceptable to the City.

10.3 Insurance

10.3.1 As a condition precedent to the effectiveness of this Agreement, during the term of this Agreement and during any renewal or extension term of this Agreement, the Contractor, at the Contractor's sole expense, shall provide insurance of such types and with such terms and limits as noted below. Providing proof of and maintaining adequate insurance coverage are material obligations of the Contractor. The Contractor shall provide the City a certificate of insurance evidencing such coverage. The Contractor's insurance coverage shall be primary insurance for all applicable policies. The limits of coverage under each

policy maintained by the Contractor shall not be interpreted as limiting the Contractor's liability and obligations under this Agreement. All insurance policies shall be from insurers authorized to write insurance policies in the State of Florida and that possess an A.M. Best rating of A-, VII or better. All insurance policies are subject to approval by the City's Risk Manager.

The coverages, limits, and endorsements required herein protect the interests of the City, and these coverages, limits, and endorsements may not be relied upon by the Contractor for assessing the extent or determining appropriate types and limits of coverage to protect the Contractor against any loss exposure, whether as a result of this Agreement or otherwise. The requirements contained herein, as well as the City's review or acknowledgement, are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under this Agreement.

The following insurance policies and coverages are required:

10.3.2 Commercial General Liability

Coverage must be afforded under a Commercial General Liability policy with limits not less than:

- $1,000,000 each occurrence and $2,000,000 aggregate for Bodily Injury, Property Damage, and Personal and Advertising Injury
- $1,000,000 each occurrence and $2,000,000 aggregate for Products and Completed Operations

Policy must include coverage for Contractual Liability and Independent Contractors.

The City and the City's officers, employees, and volunteers are to be covered as additional insureds with a CG 20 26 04 13 Additional Insured – Designated Person or Organization Endorsement or similar endorsement providing equal or broader Additional Insured Coverage with respect to liability arising out of activities performed by or on behalf of the Contractor. The coverage shall contain no special limitation on the scope of protection afforded to the City or the City's officers, employees, and volunteers.

10.3.3 Business Automobile Liability

Coverage must be afforded for all Owned, Hired, Scheduled, and Non-Owned vehicles for Bodily Injury and Property Damage in an amount not less than $1,000,000 combined single limit each accident.

If the Contractor does not own vehicles, the Contractor shall maintain coverage for Hired and Non-Owned Auto Liability, which may be satisfied by way of endorsement to the Commercial General Liability policy or separate Business Auto Liability policy.

10.3.4 Workers' Compensation and Employer's Liability

Coverage must be afforded per Chapter 440, Florida Statutes. Any person or entity performing work for or on behalf of the City must provide Workers' Compensation insurance. Exceptions and exemptions will be allowed by the City's Risk Manager, if they are in accordance with Florida Statute.

The Contractor waives, and the Contractor shall ensure that the Contractor's insurance carrier waives, all subrogation rights against the City and the City's

officers, employees, and volunteers for all losses or damages. The City requires the policy to be endorsed with WC 00 03 13 Waiver of our Right to Recover from Others or equivalent.

The Contractor must be in compliance with all applicable State and federal workers' compensation laws, including the U.S. Longshore Harbor Workers' Act and the Jones Act, if applicable.

Insurance Certificate Requirements

i. The Contractor shall provide the City with valid Certificates of Insurance (binders are unacceptable) no later than thirty (30) days prior to the start of work contemplated in this Agreement.
j. The Contractor shall provide to the City a Certificate of Insurance having a thirty (30) day notice of cancellation; ten (10) days' notice if cancellation is for nonpayment of premium.
k. In the event that the insurer is unable to accommodate the cancellation notice requirement, it shall be the responsibility of the Contractor to provide the proper notice. Such notification will be in writing by registered mail, return receipt requested, and addressed to the certificate holder.
l. In the event the Agreement term goes beyond the expiration date of the insurance policy, the Contractor shall provide the City with an updated Certificate of Insurance no later than ten (10) days prior to the expiration of the insurance currently in effect. The City reserves the right to suspend the Agreement until this requirement is met.
m. The Certificate of Insurance shall indicate whether coverage is provided under a claims-made or occurrence form. If any coverage is provided on a claims-made form, the Certificate of Insurance must show a retroactive date, which shall be the effective date of the initial contract or prior.
n. The City shall be named as an Additional Insured on all liability policies, with the exception of Workers' Compensation.
o. The City shall be granted a Waiver of Subrogation on the Contractor's Workers' Compensation insurance policy.
p. The title of the Agreement, Bid/Contract number, event dates, or other identifying reference must be listed on the Certificate of Insurance.

The Certificate Holder should read as follows:
City of Fort Lauderdale
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

The Contractor has the sole responsibility for the payment of all insurance premiums and shall be fully and solely responsible for any costs or expenses as a result of a coverage deductible, co-insurance penalty, or self-insured retention; including any loss not covered because of the operation of such deductible, co-insurance penalty, self-insured retention, or coverage exclusion or limitation. Any costs for adding the City as an Additional Insured shall be at the Contractor's expense.

If the Contractor's primary insurance policy/policies do not meet the minimum requirements, as set forth in this Agreement, the Contractor may provide evidence of an Umbrella/Excess insurance policy to comply with this requirement.

The Contractor's insurance coverage shall be primary insurance as applied to the City and the City's officers, employees, and volunteers. Any insurance or self-insurance maintained by the City covering the City, the City's officers, employees, or volunteers shall be non-contributory.

Any exclusion or provision in the insurance maintained by the Contractor that excludes coverage for work contemplated in this Agreement shall be unacceptable and shall be considered breach of contract.

All required insurance policies must be maintained until the contract work has been accepted by the City, or until this Agreement is terminated, whichever is later. Any lapse in coverage shall be considered breach of contract. In addition, Contractor must provide to the City confirmation of coverage renewal via an updated certificate should any policies expire prior to the expiration of this Agreement. The City reserves the right to review, at any time, coverage forms and limits of Contractor's insurance policies.

The Contractor shall provide notice of any and all claims, accidents, and any other occurrences associated with this Agreement shall be provided to the Contractor's insurance company or companies and the City's Risk Management office as soon as practical.

It is the Contractor's responsibility to ensure that any and all of the Contractor's independent contractors and subcontractors comply with these insurance requirements. All coverages for independent contractors and subcontractors shall be subject to all of the applicable requirements stated herein. Any and all deficiencies are the responsibility of the Contractor.

10.3.5 ADDITIONAL COVERAGES (for specialty contracts as determined by Risk Management)

10.3.5.1 Crane and Rigging Liability

Coverage must be afforded for any crane operations under the Commercial General or Business Automobile Liability policy as necessary, in line with the limits of the associated policy.

10.3.5.2 Marine Liability including Hull/Protection & Indemnity

The Contract should provide marine liability including hull/protection indemnity with a $1,000,000 Combined Single Limit.

10.3.5.3 Property Coverage (Builder's Risk)

Coverage must be afforded in an amount not less than 100% of the total project cost, including soft costs, with a deductible of no more than $25,000 each claim. Coverage form shall include, but not be limited to:

- All Risk Coverage including Flood and Windstorm with no coinsurance clause
- Guaranteed policy extension provision
- Waiver of Occupancy Clause Endorsement, which will enable the City to occupy the facility under construction/renovation during the activity
- Storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project

- Equipment Breakdown for cold testing of all mechanized, pressurized, or electrical equipment

This policy shall insure the interests of the owner, contractor, and subcontractors in the property against all risk of physical loss and damage, and name the City as a loss payee. This insurance shall remain in effect until the work is completed and the property has been accepted by the City.

10.3.5.4 Watercraft Liability

Coverage must be afforded in an amount not less than $1,000,000 per occurrence and must cover the utilization of watercraft, including Bodily Injury and Property Damage arising out of ownership, maintenance, or use of any watercraft, including owned, non-owned, and hired.

Coverage may be provided in the form of an endorsement to the Commercial General Liability policy, or in the form of a separate policy covering Watercraft Liability or Protection and Indemnity for Bodily Injury and Property Damage.

NOTE: CITY PROJECT NUMBER AND NAME MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORTLAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED" ON ALL LIABILITY POLICIES, WITH THE EXCEPTION OF WORKERS' COMPENSATION.

A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the insurance companies' names for all required coverage, and the dollar amounts of the coverage.

ARTICLE 11- WARRANTY AND GUARANTEE, TESTS AND INSPECTIONS, CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

11.1 Warranty: The Contractor warrants and guarantees to the City that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects shall be given to the Contractor. All defective work, whether or not in place, may be rejected, corrected or accepted as provided in this Article.

11.1.1 Warranty of Title: The Contractor warrants to the City that it possesses good, clear and marketable title to all equipment and materials provided and that there are no pending liens, claims or encumbrances against the equipment and materials.

11.1.2 Warranty of Specifications: The Contractor warrants that all equipment, materials and workmanship furnished, whether furnished by the Contractor, its subcontractors or suppliers, will comply with the specifications, drawings and

other descriptions supplied or adopted and that all services will be performed in a workmanlike manner.

11.1.3 Warranty of Merchantability: The Contractor warrants that any and all equipment to be supplied pursuant to this Agreement is merchantable, free from defects, whether patent or latent in material or workmanship, and fit for the ordinary purposes for which it is intended.

11.2 Tests and Inspections: Contractor shall retain the services of an independent, certified, testing lab to perform all testing as required by the specifications, Contract drawings, and any applicable permitting agency. Contractor shall provide evidence of certification to the City before the work and testing is done. Testing results shall be submitted to the Engineer for review and approval at the time the results are provided to the Contractor. The Contractor shall give the Project Manager and City Inspector a minimum of twenty-four (24) hours' advanced notice of readiness of the Work for all required inspections, tests, or approvals and shall notify all applicable permitting agencies in a timely manner based on requirements set forth in the permit documents.

11.2.1 Neither observations by the Project Manager nor inspections, tests or approvals by others shall relieve the Contractor from its obligations to perform the Work in accordance with the Contract Documents.

11.3 Uncovering Work: If any work that is to be inspected, tested or approved is covered without approval or consent of the Project Manager, it must, if requested by the Project Manager, be uncovered for observation and/or testing. Such uncovering and replacement shall be at the Contractor's sole expense unless the Contractor has given the Project Manager timely notice of the Contractor's intention to cover such Work and the Project Manager has not acted with reasonable promptness in response to such notice.

11.3.1 If the Project Manager considers it necessary or advisable that Work covered in accordance with Paragraph 11.2.1, 11.2.2 and 11.2.3 be observed by the City or inspected or tested by others, the Contractor at the City's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Project Manager may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection testing and reconstruction if he makes a claim therefore as provided in Articles 14 and 15.

11.4 City May Stop the Work: If the Work is defective, or the Contractor fails to supply sufficient skilled supervisory personnel or workmen or suitable materials or equipment or the work area is deemed unsafe, the City may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the City to stop the Work shall not give rise to any duty on the part of the City to exercise this right for the benefit of the Contractor or any other party.

The City will not award any increase in Contract Price or Contract Time if the Work is stopped due to the circumstances described herein.

11.5 Correction or Removal of Defective Work Before Final Payment: If required by the Project Manager, the Contractor shall promptly, without cost to the City and as Specified by the Project Manager, either correct any defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by the City remove it from the site and replace it with non-defective Work.

11.6 One Year Correction Period After Final Payment: If within one (1) year after the date of final acceptance, or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work is found to be defective, the Contractor shall promptly, without cost to the City and in accordance with the City's written instructions, either correct such defective Work, or, if it has been rejected by the City, remove it from the site and replace it with non-defective Work.

If The Contractor does not promptly comply with the terms of such instructions or in an emergency where delay would cause serious risk of loss or damage, the City may have the defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs for such removal and replacement, including compensation for additional professional services, shall be paid by the Contractor.

11.7 Acceptance of Defective Work, Deductions: If, instead of requiring correction or removal and replacement of defective Work, the City, at the city's sole option, prefers to accept it, the City may do so. In such a case, if acceptance occurs prior to the Project Manager's recommendation of final payments, a Change Order shall be issued incorporating the necessary revisions in the Contracts Documents, including appropriate reduction in the Contract Price; or if the acceptance occurs after such recommendation, an appropriate amount shall be paid by the Contractor to the City.

11.8 City May Correct Defective Work: If the Contractor fails within a reasonable time after written notice of the Project Manager to proceed to correct defective Work or to remove and replace rejected Work as required by the Project Manager in accordance with Paragraph 11.5, or if the Contractor fails to perform the Work in accordance with the Contract Documents, the City may, after seven (7) days written notice to the Contractor, correct and remedy any such deficiency. In exercising its rights under this paragraph, the City shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the City may exclude the Contractor from all or part of the site, take possession of all or part of the Work, suspend the Contractor's services related thereto and take possession of the Contractor's tools, construction equipment and materials stored at the site or elsewhere. The Contractor shall allow the City's representative agents and employees such access to the site as may be necessary to enable the City to exercise its rights under this paragraph. All direct and indirect costs of the City in exercising such rights shall be charged against the Contractor in an amount verified by the Project Manager, and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents and a reduction in the Contract Price. Such direct and indirect costs shall include, in particular but without limitation, compensation for additional professional services required and costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the Contractor's defective Work. The Contractor shall not

be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by the City of the City's right hereunder.

ARTICLE 12 – INDEMNIFICATION

12.1 Disclaimer of Liability: The City shall not at any time, be liable for injury or damage occurring to any person or property from any cause, whatsoever, arising out of Contractor's construction and fulfillment of this agreement.

12.2 Indemnification: For other, additional good valuable consideration, the receipt and sufficiency of which is hereby acknowledged:

12.2.1 Contractor shall, at its sole cost and expense, indemnify and hold harmless the City, its representatives, employees and elected and appointed officials from or on account of all claims, damages, losses, liabilities and expenses, direct, indirect or consequential including but not limited to fees and charges of engineers, architects, attorneys, consultants and other professionals and court costs arising out of or in consequence of the performance of this Agreement at all trial and appellate levels. Indemnification shall specifically include but not be limited to claims, damages, losses, liabilities and expenses arising out of or from (a) the negligent or defective design of the project and Work of this Agreement; (b) any act, omission or default of the Contractor, its Subcontractors, agents, servants or employees; (c) any and all bodily injuries, sickness, disease or death; (d) injury to or destruction of tangible property, including any resulting loss of use; (e) other such damages, liabilities, or losses received or sustained by any person or persons during or on account of any operations connected with the construction of this Project including the warranty period; (f) the use of any improper materials; (g) any construction defect including both patent and latent defects; (h) failure to timely complete the work; (i) the violation of any federal, state, county or city laws, ordinances or regulations by Contractor, its subcontractors, agents, servants, independent *contractors* or employees; (j) the breach or alleged breach by Contractor of any term of the Agreement, including the breach or alleged breach of any warranty or guarantee.

12.2.2 Contractor agrees to indemnify, defend, save and hold harmless the City, its officers, agents and employees, from all damages, liabilities, losses, claims, fines and fees, and from any and all suits and actions of every name and description that may be brought against City, its officers, agents and employees, on account of any claims, fees, royalties, or costs for any invention or patent and/or for the infringement of any and all copyrights or patent rights claimed by any person, firm, or corporation.

12.2.3 Contractor shall pay all claims, losses, liens, settlements or judgments of any nature in connection with the foregoing indemnifications including, but not limited to, reasonable attorney's fees and costs for trails and appeals.

12.2.4 If any Subcontractor, supplier, laborer, or materialmen of Contractor or any other person directly or indirectly acting for or through Contractor files or attempts to file a mechanic's or construction lien against the real property on which the work is performed or any part or against any personal property or

improvements thereon or make a claim against any monies due or to become due from the City to Contractor or from Contractor to a Subcontractor, for or on account of any work, labor, services, material, equipment, or other items furnished in connection with the Work or any change order, Contractor agrees to satisfy, remove, or discharge such lien or claim at its own expense by bond, payment, or otherwise within five (5) days of the filing or from receipt of written notice from the City.

Additionally, until such time as such lien or claim is satisfied, removed or discharged by Contractor, all monies due to Contractor, or that become due to Contractor before the lien or claim is satisfied, removed or otherwise discharged, shall be held by City as security for the satisfaction, removal and discharge of such lien and any expense that may be incurred while obtaining the discharge. If Contractor shall fail to do so, City shall have the right, in addition to all other rights and remedies provided by this Agreement or by law, to satisfy, remove, or discharge such lien or claim by whatever means City chooses at the entire and sole cost and expense of Contractor which costs and expenses shall, without limitation, include attorney's fees, litigation costs, fees and expenses and all court costs and assessments, and which shall be deducted from any amount owing to Contractor. In the event the amount due Contractor is less than the amount required to satisfy Contractor's obligation under this, or any other article, paragraph or section of this Agreement, the Contractor shall be liable for the deficiency due the City.

12.2.5 The Contractor and the City agree that Section 725.06(2), Florida Statutes controls the extent and limits of the indemnification and hold harmless provisions of this Agreement, if any, and that the parties waive any defects in the wording of this Article that runs afoul of said statutory section.

ARTICLE 13 – CHANGES IN THE WORK

13.1 Without invalidating this Agreement, the City may, at any time or from time to time order additions, deletions or revisions in the Work through the issuance of Change Orders. Upon receipt of a Change Order, the Contractor shall proceed with the Work involved. All Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 14 or Article 15 on the basis of a claim made by either Party.

13.2 The Project Manager may authorize minor changes in the work not involving an adjustment in the Contract Price or the Contract Time, which are consistent with the overall intent of the Contract Documents. Such changes must be in writing and signed by the City and the Contractor.

13.3 If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it will be the Contractor's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. The Contractor shall furnish proof of such adjustment to the City.

ARTICLE 14 – CHANGE OF CONTRACT PRICE

Change of Contract Price, approved by City, shall be computed as follows:

14.1 Cost of the Work: The term "Cost of the Work" means the sum of all direct costs necessarily incurred and paid by Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by the City, these costs shall be in amounts no higher than those prevailing in the City and shall include only the following items and shall not include any of the costs itemized in Paragraph 14.3:

14.1.1 Payroll costs for employees in the direct employ of the Contractor in the performance of the Work under schedules of job classifications agreed upon by the City and the Contractor. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus and cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, worker's compensation, health and retirement benefits, bonuses, sick leave, vacation and applicable holiday pay.

14.1.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage, and required suppliers and field services. All cash discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the City, and the Contractor shall make provisions so that they may be obtained.

14.1.3 Supplemental costs including the following:

14.1.3.1 Cost, including transportation and maintenance of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work.

14.1.3.2 Rentals of all construction equipment and machinery and the parts whether rented from the Contractor or others in accordance with rental agreements approved by the City, and the costs of transporting, loading, unloading, installation, dismantling and removal. The rental of any such equipment, machinery or parts shall cease when the use is no longer necessary for the Work.

14.1.3.3 Sales, consumer, use or similar taxes related to the Work and for which the Contractor is liable, imposed by laws and regulations.

14.1.3.4 Royalty payments and fees for permits and licenses.

14.1.3.5 The cost of utilities, fuel and sanitary facilities at the Work site.

14.1.3.6 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

14.1.3.7 Cost of premiums for additional bonds and insurance required because of changes in the Work.

14.2 The Contract Price may only be increased by a Change Order when Work is modified in accordance with Article 13 and approved by the City in writing. Any claim for an increase in the Contract Price resulting from a Change Order shall be based on written notice delivered to the Project Manager within ten (10) days of the occurrence of the Change Order giving rise to the claim. Notice of the amount of the claim with supporting data shall be included in the Change Order and delivered within twenty (20) days of such occurrence unless Project Manager allows an additional period of time to ascertain accurate cost data. Any change in the Contract Price resulting from any such claim shall be incorporated in the Change Order. **IT IS EXPRESSLY AND SPECIFICALLY AGREED THAT ANY AND ALL CLAIMS FOR CHANGES TO THE CONTRACT PRICE SHALL BE WAIVED IF NOT SUBMITTED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THIS SECTION.**

14.3 Not Included in the Cost of the Work: The term "cost of the Work" shall not include any of the following:

14.3.1 Payroll costs and other compensation of the Contractor's officers executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditor, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by the Contractor whether at the site or in the Contractor's principal or branch office for general administration of the work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 14.1.1, all of which are to be considered administrative costs covered by the Contractor's fee.

14.3.2 Expenses of the Contractor's principal and branch offices other than the Contractor's office at the site.

14.3.3 Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work and charges against the Contractor for delinquent payments.

14.3.4 Cost of premiums for all bonds and for all insurance whether or not the Contractor is required by the Contract Documents to purchase and maintain the same.

14.3.5 Costs due to the negligence of the Contractor, any subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

14.3.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 14.1

14.4 Basis of Compensation: The Contractor's compensation, allowed to the Contractor for overhead and profit, shall be determined as follows:

14.4.1 A mutually acceptable negotiated fee:

14.4.1.1 For costs incurred under Paragraphs 14.1.1 and 14.1.2, the Contractor's fee shall not exceed five percent (5%).

14.4.1.2 No fee shall be payable on the basis of costs itemized under Paragraphs 14.1.3.1, 14.1.3.2, 14.1.3.3, 14.1.3.4, 14.1.3.5, 14.1.3.6, 14.1.3.7, 14.3.1, 14.3.2, 14.3.3, 14.3.4, 14.3.5 and 14.3.6.

14.4.1.3 The amount of credit to be allowed by the Contractor to the City for any such change which results in a net decrease plus a deduction in the Contractor's fee by an amount equal to five percent (5%) for the net decrease.

14.4.1.4 When both additions and credits are involved in any one change the combined overhead and profit shall be figured on the basis of net increase if any, however, not to exceed five percent (5%) of the agreed compensation. Profit will not be paid on any Work not performed.

14.5 Cost Breakdown Required: Whenever the cost of any Work is to be determined pursuant to this Article, the Contractor will submit in form acceptable to the City an itemized cost breakdown together with supporting documentation. Whenever a change in the Work is to be based upon mutual acceptance of a lump sum, whether the amount is an addition, credit, or no-charge-in-cost, the Contractor shall submit an estimate substantiated by a complete itemized breakdown:

14.5.1 The breakdown shall list quantities and unit prices for materials, labor, equipment and other items of cost.

14.5.2 Whenever a change involves the Contractor and one (1) or more subcontractors and the change is an increase in the agreed compensation, the overhead and profit percentage for the Contractor and each subcontractor shall be itemized separately.

14.6 Time for the City to Approve Extra Work: Any Extra Work in an amount up to and not exceeding a cumulative amount of $25,000 for a specific project can be approved by the City Manager and shall require a written Change Order proposal to be submitted to the Public Works Director for submittal and approval by the City Manager. Extra Work exceeding the cumulative amount of $25,000 for a specific project must be approved by the City Commission and a written Change Order proposal must be submitted to the Public Works Director for submittal and approval by the City Manager and City Commission. No financial or time claim for delay to the project resulting from the Change Order approval process outlined above under Section 14.6 will be allowed.

ARTICLE 15 – CHANGE OF THE CONTRACT TIME

15.1 The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to the Project Manager within five (5) days of the occurrence of the event giving rise to the claim. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

15.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of the Contractor if a claim is made there for as provided in Paragraph 15.1. Such delays shall include but not be limited to, acts or neglect by the City, or to fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

15.3 All time limits stated in the Contract Documents are of the essence. The provisions of this Article 15 shall not exclude recovery for damages for delay by the Contractor.

15.4 Delays caused by or resulting from entities, contractors or subcontractors who are not affiliated with the CONTRACTOR (non-affiliated Contractors) shall not give rise to a claim by the CONTRACTOR for damages for increases in material and/or labor costs. Such entities, contractors and subcontractors include, but are not limited to, the City's contractors and subcontractors, Florida Power and Light Company, AT&T and Florida East Coast Railway, LLC.

15.5 Rights of Various Interests: Whenever work being done by City's forces or by other contractors is contiguous to or within the limits of work covered by this Contract, the respective rights of the various interests involved shall be established by the Project Manager to secure the completion of the various portions of the work in general harmony.

ARTICLE 16 – LIQUIDATED DAMAGES

16.1 Upon failure of the Contractor to complete the Work within the time specified for completion, the Contractor shall pay to the City the sum of **Five Hundred Dollars ($500.00)** for each and every calendar day that the completion of the Work is delayed beyond the time specified in this Agreement for completion, as fixed and agreed liquidated damages and not as a penalty, so long as the delay is caused by the Contractor. Should an act of God or the acts or omissions of the City, its agents or representatives, in derogation to the terms of this Agreement cause the delay, the Contractor shall not be responsible for the delay nor liquidated damages. Liquidated damages are fixed and agreed upon between the Parties, recognizing the impossibility of precisely ascertaining the amount of damages that will be sustained by the City as a consequence of such delay and both parties desiring to obviate any question of dispute concerning the amount of damages and the cost and effect of the failure of the Contractor to complete the Work on time. Liquidated damages shall apply separately to each portion of the Work for which a time of completion is given. The City shall have the right to deduct from or retain any compensation which may be due or which may become due and payable to the Contractor the amount of liquidated damages, and if the amount retained by the City is insufficient to pay in full such liquidated damages, the Contractor shall pay all

liquidated damages in full. The Contractor shall be responsible for reimbursing the City, in addition to liquidated damages or other damages for delay, for all costs of engineering, architectural fees, and inspection and other costs incurred in administering the construction of the Project beyond the completion date specified or beyond an approved extension of time granted to the Contractor whichever is later. Delays caused by or resulting from entities, contractors or subcontractors who are not affiliated with the Contractor shall not give rise to a claim by Contractor for damages for increase in material and/or labor costs. Such entities, contractors and subcontractors include, but are not limited to, the City's contractors and subcontractors, Florida Power and Light Company, AT&T, and Florida East Coast Railway, LLC.

16.2 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any reason, allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

ARTICLE 17 – SUSPENSION OF WORK AND TERMINATION

17.1 City May Suspend Work: The City may, at any time and without cause, suspend the Work or any portion of the Work for a period of not more than ninety (90) days by notice in writing to the Contractor which shall fix the date on which Work shall be resumed. The Contractor shall resume the Work on the date fixed. The Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension, if the Contractor makes a claim as provided in Articles 14 and 15.

17.2 City's Right to Terminate Contract: The City may terminate this Agreement upon fifteen (15) calendar days' written notice upon the occurrence of any one or more of the following events:

17.2.1 If the Contractor commences a voluntary case or a petition is filed against the Contractor, under any chapter of the Bankruptcy Code, or if the Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency.

17.2.2 If the Contractor makes a general assignment for the benefit of creditors.

17.2.3 If a trustee, receiver, custodian or agent of the Contractor is appointed under applicable law or under Contract, whose appointment or authority to take charge of property of the Contractor is for the purpose of enforcing a lien

against such property or for the purpose of general administration of such property for the benefit of the Contractor's creditors.

17.2.4 If Contractor fails to begin the Work within fifteen (15) calendar days after the Project Initiation Date, or fails to perform the Work with sufficient workers and equipment or with sufficient materials to ensure the prompt completion of the Work, or shall perform the Work unsuitably, or cause it to be rejected as defective and unsuitable, or shall discontinue the prosecution of the Work pursuant to the accepted schedule or if Contractor shall fail to perform any material term set forth in the Contract Documents, or from any other cause whatsoever shall not carry on the Work in an acceptable manner, Project Manager may give notice in writing to Contractor and its Surety of such delay, neglect or default, specifying the same.

17.2.5 If the Contractor repeatedly fails to make prompt payments to subcontractors or for labor, material or equipment.

17.2.6 If the Contractor repeatedly disregards proper safety procedures.

17.2.7 If the Contractor disregards any local, state or federal laws or regulations.

17.2.8 If the Contactor otherwise violates any provisions of this Agreement.

17.3 If Contractor, within a period of ten (10) calendar days after such notice, shall not proceed in accordance therewith, the City may exclude the Contractor from the Work site and take the prosecution of the Work out of the hands of the Contractor, and take possession of the Work and all of the Contractor's tools, appliances, construction equipment and machinery at the site and use them without liability to the City for trespass or conversion, incorporate in the Work all materials and equipment stored at the site or for which the City has paid the Contractor but which are stored elsewhere, and finish the Work as the City may deem expedient. In this instance, the Contractor shall not be entitled to receive any further compensation until the Work is finished.

17.3.1 If after notice of termination of Contractor's right to proceed, it is determined for any reason that Contractor was not in default, the rights and obligations of City and Contractor shall be the same as if the notice of termination had been issued pursuant to the Termination for Convenience clause as set forth in Section 17.5 below.

17.3.2 Upon receipt of Notice of Termination pursuant to Sections 17.2 or 17.5, Contractor shall promptly discontinue all affected work unless the Notice of Termination directs otherwise and deliver or otherwise make available to City all data, drawings, specifications, reports, estimates, summaries and such other information as may have been required by the Contract Documents whether completed or in process.

17.4 If the Contractor commits a default due to its insolvency or bankruptcy, the following shall apply:

17.4.1 Should this Agreement be entered into and fully executed by the parties, funds released and the Contractor (Debtor) files for bankruptcy, the following shall occur:

17.4.1.1 In the event the Contactor files a voluntary petition under 11 U.S.C. 301 or 302, or an order for relief is entered under 11 U.S.C. 303, the Contractor shall acknowledge the extent, validity, and priority of the lien recorded in favor of the City. The Contractor further agrees that in the event of this default, the City shall, at its option, be entitled to seek relief from the automatic stay pursuant to 11 U.S.C. 362. The City shall be entitled to relief from the automatic stay pursuant to 11 U.S.C. 362(d) (1) or (d) (2), and the Contactor agrees to waive the notice provisions in effect pursuant to 11 U.S.C. 362 and any applicable Local Rules of the United States Bankruptcy Court. The Contactor acknowledges that such waiver is done knowingly and voluntarily.

17.4.1.2 Alternatively, in the event the City does not seek stay relief, or if stay relief is denied, the City shall be entitled to monthly adequate protection payments within the meaning of 11 U.S.C. 361. The monthly adequate protection payments shall each be in an amount determined in accordance with the Note and Mortgage executed by the Contractor in favor of the City.

17.4.1.3 In the event the Contractor files for bankruptcy under Chapter 13 of Title 11, United States Code in additional to the foregoing provisions, the Contractor agrees to cure any amounts in arrears over a period not to exceed twenty-four (24) months from the date of the confirmation order, and such payments shall be made in addition to the regular monthly payments required by the Note and mortgage. Additionally, the Contractor shall agree that the City is over secured and, therefore, entitled to interest and attorney's fees pursuant to 11 U.S.C. 506(b). Such fees shall be allowed and payable as an administrative expense. Further, in the event the Contractor has less than five (5) years of payments remaining on the Note, the Contractor agrees that the treatment afforded to the claim of the City under any confirmed plan of reorganization shall provide that the remaining payments shall be satisfied in accordance with the Note, and that the remaining payments or claim shall not be extended or amortized over a longer period than the time remaining under the Note.

17.4.2 Should this Agreement be entered into and fully executed by the parties, and the funds have not been forwarded to Contractor, the following shall occur:

17.4.2.1 In the event the Contractor files a voluntary petition pursuant to 11 U.S.C. 301 or 302, or an order for relief is entered under 11 U.S.C. 303., the Contractor acknowledges that the commencement of a bankruptcy proceeding constitutes an event of default under the terms of this Agreement. Further, the Contractor acknowledges that this Agreement constitutes an executory contract within the meaning of 11 U.S.C. 365. The Contractor acknowledges that this Agreement is not capable of being assumed pursuant to 11 U.S.C. 365(c)(2), unless the

City expressly consents in writing to the assumption. In the event the City consents to the assumption, the Contractor agrees to file a motion to assume this Agreement within ten (10) days after receipt of written consent from the City, regardless of whether the bankruptcy proceeding is pending under Chapter 7, 11, or 13 of Title 11 of the United States Code. The Contractor further acknowledges that this Agreement is not capable of being assigned pursuant to 11 U.S.C. 365(b)(1).

17.5 Termination for Convenience: This Contract may be terminated for convenience in writing by City upon thirty (30) days written notice to Contractor (delivered by certified mail, return receipt requested) of intent to terminate and the date on which such termination becomes effective. In such case, Contractor shall be paid for all work executed and expenses incurred prior to termination in addition to termination settlement costs reasonably incurred by Contractor relating to commitments which had become firm prior to the termination. Payment shall include reasonable profit for work/services satisfactorily performed. No payment shall be made for profit for work/services which have not been performed.

17.6 Where the Contractor's service have been so terminated by the City, the termination shall not affect any rights of the City against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due the Contractor by the City will not release the Contractor from liability.

17.7 The Contractor has no right, authority or ability to terminate the Work except for the wrongful withholding of any payments due the Contractor from the City.

ARTICLE 18 – DISPUTE RESOLUTION

18.1 Resolution of Disputes: Questions, claims, difficulties and disputes of whatever nature which may arise relative to the technical interpretation of the Contract Documents and fulfillment of this Agreement as to the character, quality, amount and value of any work done and materials furnished, or proposed to be done or furnished under or, by reason of, the Contract Documents which cannot be resolved by mutual agreement of Contract Administrator and Contractor shall be submitted to the Consultant for resolution. When either party has determined that a disputed question, claim, difficulty or dispute is at an impasse, that party shall notify the other party in writing and submit the question, claim, difficulty or dispute to the Consultant for resolution. The parties may agree to a proposed resolution at any time without the involvement and determination of the Consultant.

18.1.1 Consultant shall notify Contract Administrator and Contractor in writing of Consultant's decision within twenty-one (21) calendar days from the date of the submission of the question, claim, difficulty or dispute, unless Consultant requires time to gather information or allow the parties to provide additional information.

18.1.2 In the event the determination of a dispute by the Consultant under this Article is unacceptable to any of the parties hereto, the party objecting to the determination must notify the other party and the City Manager, in writing within ten (10) days after receipt of the determination. The notice must state

the basis of the objection and the proposed resolution. Final resolution of such dispute shall be made by the City Manager. The City Manager's decision shall be final and binding on the parties.

18.1.3 All non-technical administrative disputes (such as billing and payment) shall be determined by Contract Administrator.

18.1.4 During the pendency of any dispute and after a determination thereof, Contractor, Consultant, and Contract Administrator shall act in good faith to mitigate any potential damages including utilization of construction schedule changes and alternate means of construction. During the pendency of any dispute arising under this Agreement, other than termination herein, Contractor shall carry on the Work and adhere to the progress schedule. The Work shall not be delayed or postponed pending resolution of any disputes or disagreements.

18.1.5 For any disputes which remain unsolved, within sixty (60) calendar days after Final Completion of the Work, the parties shall participate in mediation to address all unresolved disputes. A mediator shall be mutually agreed upon by the parties. Should any objection not be resolved in mediation, the parties retain all their legal rights and remedies under applicable law. If a party objecting to a determination, fails to comply in strict accordance with the requirements of this Article, said party specifically waives all of its rights provided hereunder, including its rights and remedies under applicable law.

ARTICLE 19 – NOTICES

19.1 All notices required by any of the Contract Documents shall be in writing and shall be deemed delivered upon mailing by certified mail, return receipt requested to the following:

To the City:

City Manager
City of Fort Lauderdale
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

with copy to the:

Project Manager and City Attorney
City of Fort Lauderdale
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

To the Contractor:

_____
_____
_____
_____

ARTICLE 20 – LIMITATION OF LIABILITY

20.1 The City desires to enter into this Agreement only if in so doing the City can place a limit on the City's liability for any cause of action arising out of this Agreement, so that the City's liability for any breach never exceeds the sum of $1,000. For other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Contractor expresses its willingness to enter into this Agreement with the knowledge that the Contractor's recovery from the City to any action or claim arising from the Agreement is limited to a maximum amount of $1,000, which amount shall be reduced by the amount actually paid by the City to the Contractor pursuant to this Agreement, for any action or claim arising out of this Agreement. Nothing contained in this paragraph or elsewhere in this Agreement is in any way intended either to be a waiver of the limitation placed upon the City's liability as set forth in Section 768.28, Florida Statutes, or to extend the City's liability beyond the limits established in said Section 768.28; and no claim or award against the City shall include attorney's fees, investigative costs, expert fees, suit costs or pre-judgment interest.

20.2 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any reason, allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

ARTICLE 21 – GOVERNING LAW

21.1 This Agreement shall be governed by the laws of the State of Florida. Both Parties agree that the courts of the State of Florida shall have jurisdiction of any claim arising in connection with this Agreement. Venue for any claim, objection or dispute arising out of this Agreement shall be in Broward County, Florida. **By entering into this Contract, Contractor and City hereby expressly waive any rights either party may have to a trial by jury or any civil litigation related to, or arising out of the Project. Contractor shall specifically bind all subcontractors to the provisions of this Contract.**

ARTICLE 22 – MISCELLANEOUS

22.1 The duties and obligations imposed by this Agreement and the rights and remedies available to the parties and, in particular but without limitation, the warranties, guaranties and obligations imposed upon the Contractor and all of the rights and remedies available to the City, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are

otherwise imposed or available by laws or regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents, and the provisions of this Paragraph will survive final payment and termination or completion of this Agreement.

22.2 The Contractor shall not assign or transfer this Agreement or its rights, title or interests. The obligations undertaken by the Contractor pursuant to this Agreement shall not be delegated or assigned to any other person or firm. Violation of the terms of this Paragraph shall constitute a material breach of Agreement by the Contractor and the City any, at its discretion, cancel this Agreement and all rights, title and interest of the Contractor which shall immediately cease and terminate.

22.3 The Contractor and its employees, volunteers and agents shall be and remain an independent contractors and not agents or employees of the City with respect to all of the acts and services performed by and under the terms of this Agreement. This Agreement shall not in any way be constructed to create a partnership, association or any other kind of joint undertaking or venture between the Parties.

22.4 The City reserves the right to audit the records of the Contractor relating in any way to the Work to be performed pursuant to this Agreement at any time during the performance and term of this Agreement and for a period of three (3) years after completion and acceptance by the City. If required by the City, the Contractor agrees to submit to an audit by an independent certified public accountant selected by the City. The Contractor shall allow the City to inspect, examine and review the records of the Contractor at any and all times during normal business hours during the term of this Agreement.

22.5 The remedies expressly provided in this Agreement to the City shall not be deemed to be exclusive but shall be cumulative and in addition to all other remedies in favor of the City now or later existing at law or in equity.

22.6 Should any part, term or provisions of this Agreement be decided by the courts to be invalid, illegal or in conflict with any state or federal law, the validity of the remaining portion or provision shall not be affected.

22.7 Prohibition Against Contracting With Scrutinized Companies: Subject to *Odebrecht Construction, Inc., v. Prasad*, 876 F.Supp.2d 1305 (S.D. Fla. 2012), *affirmed*, *Odebrecht Construction, Inc., v. Secretary, Florida Department of Transportation*, 715 F.3d 1268 (11th Cir. 2013), with regard to the "Cuba Amendment," the Contractor certifies that it is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2018), that it is not engaged in a boycott of Israel, and that it does not have business operations in Cuba or Syria, as provided in section 287.135, Florida Statutes (2018), as may be amended or revised. The City may terminate this Agreement at the City's option if the Contractor is found to have submitted a false certification as provided under subsection (5) of section 287.135, Florida Statutes (2018), as may be amended or revised, or been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List

created pursuant to Section 215.4725, Florida Statutes (2018), or is engaged in a boycott of Israel or has been engaged in business operations in Cuba or Syria, as defined in Section 287.135, Florida Statutes (2018), as may be amended or revised.

22.8 Public Entity Crimes: In accordance with the Public Crimes Act, Section 287.133, Florida Statutes, a person or affiliate who is a contractor, consultant or other provider, who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to the City, may not submit a bid on a contract with the City for the construction or repair of a public building or public work, may not submit bids on leases of real property to the City, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with the City, and may not transact any business with the City in excess of the threshold amount provided in Section 287.017, Florida Statutes, for category two purchases for a period of thirty-six (36) months from the date of being placed on the convicted vendor list. Violation of this section by Contractor shall result in cancellation of the City purchase and may result in Contractor debarment.

22.9 Attorney Fees: If CITY or CONSULTANT incurs any expense in enforcing the terms of this Agreement through litigation, the prevailing party in that litigation shall be reimbursed for all such costs and expenses, including but not limited to court costs, and reasonable attorney fees incurred during litigation.

22.10 Public Records

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT PRRCONTRACT@FORTLAUDERDALE.GOV, 954-828-5002, CITY CLERK'S OFFICE, 100 N. ANDREWS AVENUE, FORT LAUDERDALE, FLORIDA 33301.

Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service.

2. Upon request from the City's custodian of public records, provide the City with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes (2018), as may be amended or revised, or as otherwise provided by law.

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of this contract if the Contractor does not transfer the records to the City.

4. Upon completion of the Contract, transfer, at no cost, to the City all public records in possession of the Contractor or keep and maintain public records required by the

City to perform the service. If the Contractor transfers all public records to the City upon completion of this Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of this Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.

Coconut Isle Bridge Replacement
(Contractor)
Project 12089

CITY

IN WITNESS OF THE FOREGOING**,** the parties have set their hands and seals the day and year first above written.

CITY OF FORT LAUDERDALE, a municipal corporation of the State of Florida

By: _____
LEE R. FELDMAN, City Manager

(CORPORATE SEAL)

ATTEST:

By: _____
JEFFREY A. MODARELLI
City Clerk

Approved as to Legal Form:

By:_____
RHONDA MONTOYA HASAN
Assistant City Attorney

CONTRACTOR

WITNESSES:

CONTRACTOR.,
a Florida corporation.

_____ By_____

_____ _____ _____
Print Name PRINT NAME Title

_____ ATTEST:

_____ BY: _____
Print Name

_____ _____
PRINT NAME Secretary

(CORPORATE SEAL)

STATE OF FLORIDA:
COUNTY OF BROWARD:

The foregoing instrument was acknowledged before me this _____ day of _____, 2018, by _____ (Name), as _____ (Title) of _____ (CONTRACTOR), a Florida corporation, on behalf of the Corporation.

SEAL

_____
Notary Public, State of Florida

_____
Name of Notary Typed, Printed or Stamped

☐ Personally Known or ☐ Produced Identification:

Type of Identification Produced: _____

GENERAL CONDITIONS

Unless otherwise modified in the projects special conditions, the following General Conditions shall be part of the Contract:

GC - 01 - DEFINITIONS - The following words and expressions, or pronouns used in their stead, shall wherever they appear in the Contract and the Contract Documents, be construed as follows:

"Addendum" or "Addenda" - shall mean the additional Contract provisions issued in writing, by the Engineer, prior to the receipt of bids.

"Bid" – shall mean the offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

"Bidder" – shall mean any person, firm, company, corporation or entity submitting a Bid for the Work.

"Bonds" –shall mean Bid, performance and payment bonds and other instruments of security, furnished by Contractor and his surety in accordance with the Contract Documents.

“City” – shall mean the City of Fort Lauderdale, Florida, a Florida municipal corporation. In the event the City exercises its regulatory authority as a government body, the exercise of such regulatory authority and the enforcement of any rules, regulations, codes, laws and ordinances shall be deemed to have occurred pursuant to City’s authority as a governmental body and shall not be attributable in any manner to the City as a party to this Contract. For the purpose of this Contract, “City” without modification shall mean the City Commission, and/or City Manager or his/her designee(s) as applicable.

“Construction Manager” - shall mean the Public Works Director or his/her designee.

“Construction Project Manager” - shall mean the Public Works Director or his/her designee.

"Consultant" – shall mean a person, firm, company, corporation or other entity employed by the City to perform the professional services for the project.

“Contract Work” - shall mean everything expressed or implied to be required to be furnished and furnished by the Contractor by any one or more of the parts of the Contract Documents referred to in the Contract hereof except Extra Work as hereinafter defined, it being understood that, in case of any inconsistency in or between any part or parts of this Contract, the Public Works Director shall determine which shall prevail.

“Design Documents” – shall mean the construction plans and specifications included as part of a Bid/Proposal Solicitation prepared either by the City or by the Consultant under a separate Agreement with the City.

“Engineer” - shall mean the Public Works Director or his/her designee.

"Extra Work" - shall mean work other than that required by the Contract.

"Inspector" – shall mean an authorized representative of the City assigned to make necessary inspections of materials furnished by Contractor and of the Work performed by Contractor.

"Notice" - shall mean written notice sent by certified United States Mail, return receipt requested, or sent by commercial express carrier with acknowledgement of delivery, or via fax or email, or by hand delivery with a request for a written receipt of acknowledgment of delivery and shall be served upon the Contractor either personally or to its place of business listed in the Bid.

“Owner” - shall mean the City of Fort Lauderdale.

“Project Manager” - shall mean the Public Works Director or his/her designee.

"Public Works Director" –shall mean the Public Works Director of the City of Fort Lauderdale, Florida or his/her designee(s).

"Site" - shall mean the area upon or in which the Contractor's operations are carried out and such other areas adjacent thereto as may be designated as such by the Public Works Director.

"Subcontractor" - shall mean any person, firm, company, corporation or other entity, other than employees of the Contractor, who or which contracts with the contractor, to furnish, or actually furnishes labor and materials, or labor and equipment, or labor, materials and equipment at the site.

"Surety" - shall mean any corporation or entity that executes, as Surety, the Contractor's performance and payment bond securing the performance of this Contract.

GC - 02 - SITE INVESTIGATION AND REPRESENTATION - The Contractor acknowledges that it has satisfied itself as to the nature and location of the Work under the Contract Documents, the general and local conditions of the Site, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, and roads, the conformation and conditions at the ground based on City provided reports, the type of equipment and facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under the Contract Documents.

The Contractor acknowledges that it has conducted extensive tests, examinations and investigations and represents and warrants a thorough familiarization with the nature and extent of the Contract Documents, the Work, locality, soil conditions, moisture conditions and all year-round local weather and climate conditions (past and present), and, in reliance on such tests, examination and investigations conducted by Contractor and the Contractor’s experts, has determined that no conditions exist that would in any manner affect the Bid Price and that the project can be completed for the Bid Price submitted.

The Contractor, on its own, has made or caused to be made examinations, investigations, tests and studies of reports and related data in addition to those referred above, as Contractor deemed necessary to perform the Work at the Bid price set by the Contractor, within the contract time and in accordance with the other terms and conditions of the Contract Documents and the Bid made by the Contractor; and no additional examinations, investigations, tests, reports or similar data are, or will be, required by Contractor to assure that the Work can be done at the Bid price set by the Contractor.

The Contractor further acknowledges that it has satisfied itself based on any geotechnical reports the City may provide and inspection of the project Site as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site and from evaluating information derived from exploratory work that may have been done by the City or included in the

Contract Documents and finds and has further determined that no conditions exist that would in any manner affect the Bid price and that the project can be completed for the Bid price submitted..

Any failure by the Contractor to acquaint itself with all the provided information and information obtained by visiting the project Site will not relieve Contractor from responsibility for properly estimating the difficulty or cost thereof under the Contract Documents. In the event that the actual subsurface conditions vary from the actual City provided reports, the Contractor shall notify the City and the Contract amount may be adjusted depending on the conditions, at the approval of the City.

GC - 03 - SUBSTITUTIONS - If the Contractor desires to use materials and/or products of manufacturer's names different from those specified in the Contract Documents, the Bidder requesting the substitution shall make written application as described herein. The burden of proving the equality of the proposed substitution rests on the Bidder making the request. To be acceptable, the proposed substitution shall meet or exceed all expressed requirements of the Contract Documents and shall be submitted upon the Contractor's letterhead, in addition to the "Contractor's Request for Substitution" form provided by the Public Works Director. The following requirements shall be met in order for the substitution to be considered:

1. Requests for substitution shall reach the Public Works Director no less than ten (10) Working Days prior to the date set for opening of Bids; and

2. Requests for substitution shall be accompanied by such technical data, as the party making the request desires to submit. The Public Works Director will consider reports from reputable independent testing laboratories, verified experience records from previous users and other written information valid in the circumstances; and

3. Requests for substitution shall completely and clearly indicate in what respects the materials and/or products differ from those indicated in the Contract Documents; and

4. Requests for substitution shall be accompanied by the manufacturer's printed recommendations clearly describing the installation, use and care, as applicable, of the proposed substitutions; and

5. Requests for substitution shall be accompanied by a complete schedule of changes in the Contract Documents, if any, which must be made to permit the use of the proposed substitution; and

If a proposed substitution is approved by the Public Works Director, an Addendum will be issued to prospective bidders not less than three (3) working days prior to the date set for opening of Bids. Unless substitutions are received and approved as described above, the successful Bidder shall be responsible for furnishing materials and products in strict accordance with the Contract Documents.

GC - 04 - CONTROL OF THE WORK - The Public Works Director shall have full control and direction of the Work in all respects. The Public Works Director and/or his authorized designee(s) shall, at all times, have the right to inspect the Work and materials. The Contractor shall furnish all reasonable facilities for obtaining such information, as the Public Works Director may desire respecting the quality of the Work and materials and the manner of conducting the Work. Should the Contractor be directed or permitted to perform night Work, or to vary the period which work is ordinarily carried on in the daytime, he shall give ample notice to the Public Works Director so that proper and adequate inspection may be provided. Such Work shall be done only under such regulations as are furnished in writing by the Public Works Director, and no extra compensation shall be allowed to the Contractor therefore. In the event of night work, the Contractor shall furnish

such light, satisfactory to the Public Works Director, as will insure proper inspection. Nothing herein contained shall relieve the Contractor from compliance with any and all City ordinances relating to noise or Work during prohibited hours.

The Contractor shall keep the Public Works Director informed, a reasonable time in advance, as to his need for grades and lines in order that the same may be furnished and all necessary measurements made for records and for payment with the minimum of inconvenience to the Public Works Director or of delay to the Contractor. The Contractor shall submit to the Public Works Director or Inspector on the job a written request outlining the streets, etc., for which the Contractor desires lines and grades. It is the intention not to delay the Work for the giving of lines and grades, but when necessary, work operations shall be suspended for such reasonable time as the Public Works Director may require for this purpose. However, such cost increases shall be authorized either by the City Manager and/or designee, or the City Commission based upon the purchasing threshold amounts provided for in Chapter 2 of the City of Fort Lauderdale's Code of Ordinances.

GC - 05 - SUBCONTRACTOR - The Contractor shall not sublet, in whole or any part of the Work without the written consent and approval of the Public Works Director. Within ten (10) days after official notification of starting date, the Contractor must submit in writing, to the Public Works Director, a list of all Subcontractors. No Work shall be done by any Subcontractor until such Subcontractor has been officially approved by the Public Works Director. A subcontractor not appearing on the original list will not be approved without written request submitted to the Public Works Director and approved by the Public Works Director. In all cases, the Contractor shall give his personal attention to the Work of the Subcontractors and the Subcontractor is liable to be discharged by the Contractor, at the direction of the Public Works Director, for neglect of duty, incompetence or misconduct.

Acceptance of any Subcontractor, other person, or organization by the Public Works Director shall not constitute a waiver of any right of Public Works Director to reject defective Work or Work not in conformance with the Contract Documents.

Contractor shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that he is responsible for the acts and omissions of persons directly employed by him. Nothing in the Contract Documents shall create any contractual relationship between City and any Subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of City to pay or to see to the payment of any moneys due to any Subcontractor or other person, or organization, except as may otherwise be required by law.

GC – 06 - **QUANTITIES** - It is mutually agreed that the proposal shows the approximate amounts only along with the Plans and the general location. It is also mutually agreed that no change will be made involving any departure from the general scheme of the Work and that no such change involving a material change in cost, either to the City or Contractor, shall be made, except upon written permission of the City. However, the Public Works Director shall have the right to make minor alternations in the line, grade, plan, form or materials of the Work herein contemplated any time before the completion of the same. That if such alterations shall diminish the quantity of the Work to be done, such alterations shall not constitute a claim for damages or anticipated profits. That if such alterations increase the amount of the Work to be done, such increase shall be paid for according to the quantity actually performed and at the unit price or prices stipulated therefore in the Contract.

The City shall, in all cases of dispute, determine the amount or quantity of the several kinds of Work which are to be paid for under this Contract, and shall decide all questions relative to the execution of the same, and such estimates and decisions shall be final and binding.

Any Work not herein specified, which might be fairly implied as included in the Contract, of which the City shall judge, shall be done by the Contractor without extra charge. However, such cost increases shall be authorized either by the City Manager and/or designee, or the City Commission based upon the purchasing threshold amounts provided for in Chapter 2 of the City of Fort Lauderdale's Code of Ordinances.

GC–07 - NO ORAL CHANGES - Except to the extent expressly set forth in the Contract, no change in or modification, termination or discharge of the Contract in any form whatsoever, shall be valid or enforceable unless it is in writing and signed by the parties charged, therewith or their duly authorized representative.

GC - 08 - PERMITS AND PROTECTION OF PUBLIC – Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Contract. A copy of all permits shall be given to the City and become part of the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

The Contractor shall be required to observe all the ordinances in relation to obtaining permits for occupying, excavating, or in any way obstructing the streets and alleys. He shall erect and maintain barricades and sufficient safeguards around all excavations, embankments or obstructions; he shall place sufficient warning lights at or near the Work; keep the same burning from sunset to sunrise, employ watchmen, and strictly obey all laws and ordinances controlling or limiting those engaged in similar work.

Where there are telephones, light or power poles, water mains, conduits, pipes or drains or other construction, either public or private, in or on the streets or alleys, the Work shall be so conducted that no interruption or delay will be caused in the operation or use of the same. Proper written notice shall be given, and all the facilities, afforded the owners of such construction encountered or likely to be encountered, as will enable them to preserve the same from injury.

The Contractor shall not be permitted to interfere with public travel and convenience by grading or tearing up streets indiscriminately, but the Work of constructing the various items in this contract shall proceed in an orderly, systematic and progressive manner.

Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the Work to stresses or pressures that will endanger it.

Where lifting operations involving the use of specialized cranes are required as part of construction, Contractor must make undertake the following investigation and submit the results and documentation to the Engineer prior to commencing any lifting operations: marking a very specific area in the field for the placement of the crane; a drawing showing the limitations of the job operation (i.e. not over adjacent properties or pedestrian and high vehicular traffic areas);underground utility exploration in the vicinity of the crane location, which may include ground penetrating radar to identify voids or old pipe or other subsurface features that could lead to sudden failure; assessment of the underlying soil and roadway materials and a worst case analysis based on entire load being distributed on just one or two outriggers; provision of properly sized pads under the outriggers; loading charts from manufacturer showing allowable configurations/loads; and inspection to make sure crane operation is in accordance with the permit conditions.

GC - 09 - DISEASE REGULATIONS - The Contractor shall enforce all sanitary regulations and take all precautions against infectious diseases as the Public Works Director may deem necessary. Should any infectious or contagious diseases occur among his employees, he shall arrange for the immediate removal of the employee from the Site and isolation of all persons connected with the Work.

GC - 10 - CONTRACTOR TO CHECK PLANS, SPECIFICATIONS, AND DATA - The Contractor shall verify all dimensions, quantities, and details shown on the plans, supplementary drawings, schedules, or other data received from the Public Works Director, and shall notify the Public Works Director of all errors, omissions, conflicts and discrepancies found therein within three (3) working days of discovery. Failure to discover or correct errors, conflictions, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction, or improper operation resulting there from nor from rectifying such condition at his own expense.

GC - 11 - SUPPLEMENTARY DRAWINGS - When, in the opinion of the Public Works Director, it becomes necessary to explain more fully the Work to be done, or to illustrate the work further, or to show any changes which may be required, drawings, known as supplementary drawings, with specifications pertaining thereto, will be prepared by the Public Works Director and copies will be given to the Contractor.

The supplementary drawings shall be binding upon the Contractor with the same force as the original Plans. Where such supplementary drawings require either less or more than the estimated quantities of work, credit to the City or compensations therefore to the Contractor shall be subject to the terms of the Contract.

GC - 12 - MATERIALS AND WORKMANSHIP - All material and workmanship shall, in every respect, be in conformity with approved modern practice and with prevailing standards of performance and quality. In the event of dispute the Public Works Director's decision shall be final. Wherever the Plans, specifications, Contract Documents, or the directions of the Public Works Director are unclear as to what is permissible and/or fail to note the quality of any Work, that interpretation will be made by the Public Works Director, which is in accordance with approved modern practice, to meet the particular requirements of the Contract.

In all cases, new materials shall be used, unless this provision is waived by notice from the City in writing.

GC - 13 - SAFEGUARDING MARKS - The Contractor shall safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, bear the cost of re-establishing same if disturbed, or bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting or for removing without authorization, such established points, stakes and marks. The Contractor shall safeguard all existing and known property corners, monuments and marks not related to the Work and, if required, shall bear the cost of having them re-established by a licensed surveyor if disturbed or destroyed during the course of construction.

GC - 14 - EXISTING UTILITY SERVICE - All existing utility service shall be maintained with a minimum of interruption at the expense of the Contractor.

GC - 15 - JOB DESCRIPTION SIGNS – Contractor, at Contractor's expense, shall furnish, erect, and maintain suitable weatherproof signs on jobs over $100,000 containing the following information:

1. City Seal (in colors)

2. Project or Improvement Number
3. Job Description
4. Estimated Cost
5. Completion Date

Minimum size of sign shall be four feet high, eight feet wide and shall be suitably anchored. The entire sign shall be painted and present a pleasing appearance. Exact location of signs will be determined in the field. Two (2) signs will be required, one at each end of the job. All costs of this work shall be included in other parts of the work.

GC - 16 - FLORIDA EAST COAST RIGHT-OF-WAY - Whenever a City contractor is constructing within the Florida East Coast Railway Company's Right-of-Way, it will be mandatory that the contractor carry separate bodily injury and property damage insurance in the amounts as stated below. This insurance shall be taken out and maintained during the life of the Contract.

Bodily injury insurance in an amount not less than $500,000.00 for injuries, including wrongful death to any one person, and subject to the same limit for each person, in an amount not less than $1,000,000.00 on account of any one occurrence, and

Property damage insurance in an amount not less than $500,000.00 for damages on account of any one occurrence and in an amount not less than $1,000,000.00 for damages on account of all occurrences.

GC - 17 - ACCIDENTS - The Contractor shall provide such equipment and facilities as are necessary and/or required, in the case of accidents, for first aide services to be provided to a person who may be injured during the project duration. The Contractor shall also comply with the OSHA requirements as defined in the United States Labor Code 29 CFR 1926.50.

In addition, the Contractor must report immediately to the Public Works Director every accident to persons or damage to property, and shall furnish in writing full information, including testimony of witnesses regarding any and all accidents.

GC - 18 - SAFETY PRECAUTIONS - Contractor must adhere to the applicable environmental protection guidelines for the duration of a project. If hazardous waste materials are used, detected or generated at any time, the Project Manager must be immediately notified of each and every occurrence. The Contractor shall comply with all codes, ordinances, rules, orders and other legal requirements of public authorities (including OSHA, EPA, DERM, the City, Broward County, State of Florida, and Florida Building Code), which bear on the performance of the Work.

The Contractor shall take the responsibility to ensure that all Work is performed using adequate safeguards, including but not limited to: proper safe rigging, safety nets, fencing, scaffolding, barricades, chain link fencing, railings, barricades, steel plates, safety lights, and ladders that are necessary for the protection of its employees, as well as the public and City employees. All riggings and scaffolding shall be constructed with good sound materials, of adequate dimensions for their intended use, and substantially braced, tied or secured to ensure absolute safety for those required to use it, as well as those in the vicinity. All riggings, scaffolding, platforms, equipment guards, trenching, shoring, ladders and similar actions or equipment shall be OSHA approved, as applicable, and in accordance with all Federal, State and local regulations.

GC - 19 - DUST PREVENTION - The Contractor shall, by means of a water spray, or temporary asphalt pavement, take all necessary precautions to prevent or abate a dust nuisance arising from dry weather or Work in an incomplete stage. All costs of this Work shall be included in cost of other parts of the Work.

Should the Contractor fail to abate a dust nuisance by the above methods, and then he will be required to immediately construct temporary patches per City standards.

GC - 20 - PLACING BARRICADES AND WARNING LIGHTS - The Contractor shall furnish and place, at his own expense, all barricades, warning lights, automatic blinker lights and such devices necessary to properly protect the work and vehicular and pedestrian traffic. Should the Contractor fail to erect or maintain such barricades, warning lights, etc., the Public Works Director may, after 24 hours' notice to the Contractor, proceed to have such barricades and warning lights placed and maintained by City or other forces and all costs incurred thereof charged to the Contractor and may be retained by the City from any monies due, or to become due, to the Contractor.

GC - 21 - TRAFFIC CONTROL - The Contractor shall coordinate all Work and obtain, through the City's Transportation and Mobility Department, Broward County, Florida Department of Transportation, as applicable, any permits required to detour traffic or close any street before starting to work in the road. The following section: Part VI Traffic Controls for Street and Highway Construction and Maintenance Operations, MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, U.S. Department of Transportation Federal Highway Administration, 2009, or current edition, shall be used as a guide for requirement and placement of traffic control devices, signs and barricades. The Public Works Director shall determine requirements for the above. The above publication is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. In the event that a Maintenance of Traffic (MOT) Plan is required, the Plan shall be prepared by an A.A.S.T.A. certified technician.

All traffic control devices, flashing lights, signs and barricades shall be maintained in working condition at all times.

GC - 22 - COORDINATION - The Contractor shall notify all utilities, transportation department, etc., in writing, with a copy to the Public Works Director before construction is started and shall coordinate his Work with them. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal, construction and rearrangement operations in order that services rendered by these parties will not be unnecessarily interrupted.

The Contractor shall arrange his Work and dispose of his materials so as to not interfere with the operation of other Contractors engaged upon adjacent work and to join his Work to that of others in a proper manner and to perform his Work in the proper sequence in relation to that of other Contractors all as may be directed by the Public Works Director.

Each Contractor shall be responsible for any damage done by him or his agents to the work performed by another Contractor.

The Contractor shall contact the Broward County Transportation Department and the Florida Department of Transportation, as applicable, to verify and obtain location of any and all traffic conduits, loops, and street light underground services.

GC - 23 - WATER - Bulk water used for construction, flushing pipelines, and testing shall be obtained from fire hydrants. Contractor shall make payment for hydrant meter at Treasury Billing Office, 1st Floor, City Hall, 100 N. Andrews Avenue. With the paid receipt, contractor can pick up hydrant meter at the utility location office. No connection shall be made to a fire hydrant without a meter connected.

GC - 24 - PROHIBITION AGAINST CONTRACTING WITH SCRUTINIZED COMPANIES - Subject to *Odebrecht Construction, Inc., v. Prasad*, 876 F.Supp.2d 1305 (S.D. Fla. 2012), *affirmed*, *Odebrecht Construction, Inc., v. Secretary, Florida Department of Transportation*, 715 F.3d 1268 (11th Cir. 2013), with regard to the "Cuba Amendment," the Contractor certifies that it is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2018), that it is not engaged in a boycott of Israel, and that it does not have business operations in Cuba or Syria, as provided in section 287.135, Florida Statutes (2018), as may be amended or revised. The City may terminate this Agreement at the City's option if the Contractor is found to have submitted a false certification as provided under subsection (5) of section 287.135, Florida Statutes (2018), as may be amended or revised, or been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2018), or is engaged in a boycott of Israel or has been engaged in business operations in Cuba or Syria, as defined in Section 287.135, Florida Statutes (2018), as may be amended or revised.

GC - 25 - LOCATION OF UNDERGROUND FACILITIES - If the Proposer, for the purpose of responding to this solicitation, requests the location of underground facilities through the Sunshine State One-Call of Florida, Inc. notification system or through any person or entity providing a facility locating service, and underground facilities are marked with paint, stakes or other markings within the City pursuant to such a request, then the Proposer shall be deemed non-responsive to this solicitation in accordance with Section 2-184(5) of the City of Fort Lauderdale Code of Ordinances.

GC - 26 – USE OF FLORIDA LUMBER TIMBER AND OTHER FOREST PRODUCTS - In accordance with Florida Statute 255.20 (3), The City specifies that lumber, timber, and other forest products used for this project shall be produced and manufactured in the state of Florida if such products are available and their price, fitness, and quality are equal. This requirement does not apply to plywood specified for monolithic concrete forms, if the structural or service requirements for timber for a particular job cannot be supplied by native species, or if the construction is financed in whole or in part from federal funds with the requirement that there be no restrictions as to species or place of manufacture.

The Bidder affirms by submitting a bid response to this solicitation that they will comply with section 255.20 (3) Florida Statutes.

GC – 27 – PUBLIC RECORDS/TRADE SECRETS/COPYRIGHT: The Proposer's response to the Solicitation is a public record pursuant to Florida law, which is subject to disclosure by the City under the State of Florida Public Records Law, Florida Statutes Chapter 119.07 ("Public Records Law"). The City shall permit public access to all documents, papers, letters or other material submitted in connection with this Solicitation and the Contract to be executed for this Solicitation, subject to the provisions of Chapter 119.07 of the Florida Statutes.

Any language contained in the Proposer's response to the Solicitation purporting to require confidentiality of any portion of the Proposer's response to the Solicitation, except to the extent that certain information is in the City's opinion a Trade Secret pursuant to Florida law, shall be void. If a Proposer submits any documents or other information to the City which the Proposer

claims is Trade Secret information and exempt from Florida Statutes Chapter 119.07 ("Public Records Laws"), the Proposer shall clearly designate that it is a Trade Secret and that it is asserting that the document or information is exempt. The Proposer must specifically identify the exemption being claimed under Florida Statutes 119.07. The City shall be the final arbiter of whether any information contained in the Proposer's response to the Solicitation constitutes a Trade Secret. The City's determination of whether an exemption applies shall be final, and the proposer agrees to defend, indemnify, and hold harmless the City and the City's officers, employees, and agent, against any loss or damages incurred by any person or entity as a result of the City's treatment of records as public records. Proposals purporting to be subject to copyright protection in full or in part will be rejected.

EXCEPT FOR CLEARLY MARKED PORTIONS THAT ARE BONA FIDE TRADE SECRETS PURSUANT TO FLORIDA LAW, DO NOT MARK YOUR RESPONSE TO THE SOLICITATION AS PROPRIETARY OR CONFIDENTIAL. DO NOT MARK YOUR RESPONSE TO THE SOLICITATION OR ANY PART THEREOF AS COPYRIGHTED.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

Telephone Number: **(954) 828-5002**

Mailing Address: **City Clerk's Office**
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

E-mail: **prrcontract@fortlauderdale.gov**

Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service.

2. Upon request from the City's custodian of public records, provide the City with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes (2018), as may be amended or revised, or as otherwise provided by law.

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of this contract if the Contractor does not transfer the records to the City.

4. Upon completion of the Contract, transfer, at no cost, to the City all public records in possession of the Contractor or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of this Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure

requirements. If the Contractor keeps and maintains public records upon completion of this Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.

TECHNICAL SPECIFICATIONS

SECTION 101 - MOBILIZATION

101-1 Description.

Perform preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, and sanitary and other facilities.

Include the costs of bonds and any required insurance and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials.

101-2 Basis of Payment.

101-2.1 When a Separate Item is Included in the Proposal: When the proposal includes a separate item of payment for this work, the work and incidental costs specified as being covered under this Section will be paid for at the Contract lump sum price for the item of Mobilization.

Payment will be made under:

Item No. 101- 1- Mobilization -lump sum.

101-2.2 Partial Payments: When the proposal includes a separate pay item for Mobilization and the Notice to Proceed has been issued, partial payments will be made in accordance with the following:

For contracts of 120 contract days duration or less, partial payment will be made at 50% of the bid price per month for the first two months. For contracts in excess of 120 contract days duration, partial payment will be made at 25% of the bid price per month for the first four months. In no event shall more than 50% of the bid price be paid prior to commencing construction on the project site.

Total partial payments for Mobilization on any project, including when more than one project or job is included in the Contract, will be limited to 10% of the original Contract amount for that project. Any remaining amount will be paid upon completion of all work on the Contract.

Retainage, as specified in 9-5, will be applied to all partial payments.

Partial payments made on this item will in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the Contract.

101-2.3 When No Separate Item is Included in the Proposal: When the proposal does not include a separate item for Mobilization, all work and incidental costs specified as being covered under this Section will be included for payment under the several scheduled items of the overall Contract, and no separate payment will be made therefore.

SECTION 102- MAINTENANCE OF TRAFFIC

102-1 Description.

Maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work. Construct and maintain detours. Provide facilities for access to residences, businesses, etc., along the project. Furnish, install and maintain traffic control and safety devices during construction. Furnish and install work zone pavement markings for maintenance of traffic (MOT) in construction areas. Provide any other special requirements for safe and expeditious movement of traffic specified in the Plans. MOT includes all facilities, devices and operations as required for safety and convenience of the public within the work zone.

Do not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work, and repair any damage to existing pavement open to traffic.

Include the cost of any work that is necessary to meet the requirements of the Contract Documents under the MOT pay item, when there is not a pay item provided.

102-2 Materials.

Meet the following requirements:

Bituminous Adhesive.....Section 970
Temporary Retroreflective Pavement Markers…Section 990
Paint .....Section 971
Removable Tape .....Section 990
Glass Spheres.....Section 971
Temporary Traffic Control Device Materials.....Section 990
Retroreflective and Nonreflective Sheeting
for Temporary Traffic Control Devices.....Section 994

102-2.1 Temporary Traffic Control Devices: Use only the materials meeting the requirements of Section 990, Section 994, Design Standards and the Manual on Uniform Traffic Control Devices (MUTCD).

102-2.2 Detour: Provide all materials for the construction and maintenance of all detours.

102-2.3 Commercial Materials for Driveway Maintenance: Provide materials of the type typically used for base, including recycled asphalt pavement material, and having stability and drainage properties that will provide a firm surface under wet conditions.

102-3 Specific Requirements.

102-3.1 Beginning Date of Contractor's Responsibility: Maintain traffic starting the day work begins on the project or on the first day Contract Time is charged, whichever is earlier.

102-3.2 Worksite Traffic Supervisor: Provide a Worksite Traffic Supervisor who is responsible for initiating, installing, and maintaining all temporary traffic control devices as described in this Section and the Contract Documents. Provide all equipment and materials needed to set up, take down, maintain traffic control, and handle traffic-related situations. Use approved alternate Worksite Traffic Supervisors when necessary.

The Worksite Traffic Supervisor must meet the personnel qualifications specified in Section 105.

The Worksite Traffic Supervisor is to perform the following duties:

1. On site direction of all temporary traffic control on the project.
2. Is on site during all set up and take down, and performs a drive through inspection immediately after set up.
3. Is on site during all nighttime operations ensuring proper temporary traffic control.
4. Immediately corrects all safety deficiencies and corrects minor deficiencies that are not immediate safety hazards within 24 hours.
5. Is available on a 24 hour per day basis and present at the site within 45 minutes after notification of an emergency situation and is prepared to respond to maintain temporary traffic control or to provide alternate traffic arrangements.
6. Conducts daily daytime and weekly nighttime inspections of projects with predominately daytime work activities, and daily nighttime and weekly daytime inspections of projects with predominantly nighttime work activities of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as deemed necessary. Pedestrians are to be accommodated with a safe, accessible travel path around work sites separated from mainline traffic in compliance with the Americans with Disabilities Act (ADA) Standards for Transportation Facilities. Maintain existing or detour bicycle facilities satisfactorily throughout the project limits. Existing businesses in work areas are to be provided with adequate entrances for vehicular and pedestrian traffic during business hours.

The City may disqualify and remove from the project a Worksite Traffic Supervisor who fails to comply with the provisions of this Section. The City may temporarily suspend all activities, except traffic, erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions.

102-3.3 Lane Closure Information System: Approval for all lane closures, mobile operations, and traffic pacing operations is required. Submit routine requests fourteen calendar days in advance of all lane closures, mobile operations, and traffic pacing operations. For unforeseen events that require cancelling or rescheduling lane closures, mobile operations, and traffic pacing operations, revise the lane closure request as soon as possible.

102-4 Alternative Traffic Control Plan.

The Contractor may propose an alternative traffic control plan (TCP) to the plan presented in the Contract Documents. Have the Contractor's Engineer of Record sign and seal the alternative plan and submit to the Engineer. Prepare the TCP in conformance with and in the form outlined in the current version of the City's Plans Preparation Manual. Indicate in the plan a TCP for each phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that may be caused by the alternate TCP proposed by the Contractor, and notify the City in writing of any such potential impacts to utilities.

Engineer's approval of the alternate TCP does not relieve the Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor

initiated changes in the design or construction activities from those in the original Contract Specifications, Design Plans (including TCPs) or other Contract Documents and which effect a change in utility work different from that shown in the Utility Plans, joint project agreements or utility relocation schedules. resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Specifications, Design Plans (including TCPs) or other Contract Documents and which effect a change in utility work different from that shown in the Utility Plans, joint project agreements or utility relocation schedules.

The City reserves the right to reject any alternative TCP. Obtain the Engineer's written approval before beginning work using an alternate TCP. The Engineer's written approval is required for all modifications to the TCP. The Engineer will only allow changes to the TCP in an emergency without the proper documentation.

102-5 Traffic Control.

102-5.1 Standards: FDOT Design Standards are the minimum standards for the use in the development of all TCPs. The MUTCD, Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

102-5.2 Maintenance of Roadway Surfaces: Maintain all lanes that are being used for the MOT, including those on detours and temporary facilities, under all weather conditions. Keep the lanes reasonably free of dust, potholes and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

102-5.3 Number of Traffic Lanes: Maintain one lane of traffic in each direction. Maintain two lanes of traffic in each direction at existing four (or more) lane cross roads, where necessary to avoid undue traffic congestion. Construct each lane used for MOT at least as wide as the traffic lanes existing in the area before commencement of construction. Do not allow traffic control and warning devices to encroach on lanes used for MOT.

The Engineer may allow the Contractor to restrict traffic to one-way operation for short periods of time provided that the Contractor employs adequate means of traffic control and does not unreasonably delay traffic. When a construction activity requires restricting traffic to one-way operations, locate the flaggers within view of each other when possible. When visual contact between flaggers is not possible, equip them with 2-way radios, official, or pilot vehicles, or use traffic signals.

102-5.4 Crossings and Intersections: Provide and maintain adequate accommodations for intersecting and crossing traffic. Do not block or unduly restrict any median opening, road or street crossing the project unless approved by the Engineer. Before beginning any construction, submit to the Engineer the names and phone numbers of persons that can be contacted when signal operation malfunctions.

102-5.5 Access for Residences and Businesses: Provide continuous access to all residences and all places of business.

102-5.6 Protection of the Work from Injury by Traffic: Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

102-5.7 Flagger: Provide flaggers to control traffic when traffic in both directions must use a single lane and in other situations as required. All flaggers must meet the personnel qualifications specified in Section 105.

102-5.8 Conflicting Pavement Markings: Where the lane use or where normal vehicle or pedestrian paths are altered during construction, remove all pavement markings (paint, tape, thermoplastic, retroreflective pavement markers, etc.) that will conflict with the adjusted vehicle or pedestrian paths. Use of paint to cover conflicting pavement markings is prohibited. Remove conflicting pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions.

Remove all pavement markings that will be in conflict with "next phase of operation" vehicle pedestrian paths as described above, before opening to vehicle traffic or use by pedestrians.

Cost for removing conflicting pavement markings (paint, tape, thermoplastic, retroreflective pavement markers, etc.) to be included in Maintenance of Traffic, Lump Sum.

102-5.9 Vehicle and Equipment Visibility: Equip all pickups and automobiles used on the project with a minimum of one Class 2 warning light that meets the Society of Automotive Engineers Recommended Practice SAE J595, dated November 1, 2008, or SAE J845, dated December 1, 2007, and incorporated herein by reference. Existing lights that meet SAE J845, dated March, 1992, or SAE J1318, dated April, 1986, may be used to their end of service life. The warning lights shall be a high intensity amber or white rotating, flashing, oscillating or strobe light. Lights shall be unobstructed by ancillary vehicle equipment such as ladders, racks or booms. If the light is obstructed, additional lights will be required. The lights shall be operating when a vehicle is in a work area where a potential hazard exists, when operating the vehicle at less than the average speed for the facility while performing work activities, making frequent stops or called for in the Plans or Design Standards.

Equip all other vehicles and equipment with a minimum of 4 square feet of retroreflective sheeting or warning lights.

102-5.10 No Waiver of Liability: Conduct operations in such a manner that no undue hazard results due to the requirements of this Article. The procedures and policies described herein in no way acts as a waiver of any terms of the liability of the Contractor or his surety.

102-6 Deleted

102-7 Traffic Control Officer.

Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following types of work is necessary on projects:

1. Directing traffic/overriding the signal in a signalized intersection.
2. When Design Standards, Index No. 619 is used on freeway facilities (interstates, toll roads, and expressways) at nighttime for work within the travel lane.
3. When Design Standards, Index No. 655 Traffic Pacing for overhead work is called for in the Plans or approved by the Engineer.
4. When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the Plans or approved by the Engineer.
5. When Design Standards, Index No. 625 Temporary Road Closure 5 Minutes or Less is used.

102-8 Driveway Maintenance.

102-8.1 General: Ensure that each residence and business has safe, stable, and reasonable access.

102-8.2 Construction Methods: Place, level, manipulate, compact, and maintain the material, to the extent appropriate for the intended use.

As permanent driveway construction is accomplished at a particular location, the Contractor may salvage and reuse previously placed materials that are suitable for reuse on other driveways.

102-9 Temporary Traffic Control Devices.

102-9.1 Installation and Maintenance: Install and maintain temporary traffic control devices as detailed in the Plans, Index 600 of the Design Standards and when applicable, in accordance with the approved vendor drawings, as provided on the City's Approved Product List (APL). Erect the required temporary traffic control devices to prevent any hazardous conditions and in conjunction with any necessary traffic re-routing to protect the traveling public, workers, and to safeguard the work area. Use only those devices that are on the APL or meeting the requirements of the Design Standards. Immediately remove or cover any devices that do not apply to existing conditions.

All temporary traffic control devices must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or the Manual for Assessing Safety Hardware 2009 (MASH) and current FHWA directives. Manufacturers seeking evaluation must submit certified test reports showing that their product meets all test requirements set forth by NCHRP 350 or the MASH. Manufacturers seeking evaluation of Category I devices for inclusion on the APL shall include the manufacturer's self-certification letter. Manufacturer's seeking evaluation of Category II and Category III devices for inclusion on the APL shall include the FHWA WZ numbered acceptance letter with attachments and vendor drawings of the device in sufficient detail to enable the Engineer to distinguish between this and similar devices. For devices requiring field assembly or special site preparation, vendor drawings shall include all field assembly details and technical information necessary for proper application and installation. Vendor drawings for Category III devices and automated flagger assistance devices (AFADs) must be signed and sealed by a Professional Engineer registered in the State of Florida. Manufacturers seeking evaluation of Category IV devices for inclusion on the APL must comply with the requirements of Section 990 and include detailed vendor drawings of the device along with technical information necessary for proper application, field assembly and installation.

The APL number is to be permanently marked on the device at a readily visible location. Sheeting used on devices is exempt from this marking requirement.

Notify the Engineer in writing of any scheduled operation that will affect traffic patterns or safety sufficiently in advance of commencing such operation to permit review of the plan for the proposed installation of temporary traffic control devices.

Assign an employee the responsibility of maintaining the position and condition of all temporary traffic control devices throughout the duration of the Contract. Keep the Engineer advised at all times of the identification and means of contacting this employee on a
24 hour basis.

Maintain temporary traffic control devices in the correct position, properly oriented, clearly visible and clean, at all times. All traffic control devices must meet the classification level of

Acceptable as defined in the American Traffic Safety Services Association (ATSSA) Quality Guidelines for Temporary Traffic Control Devices and Features (2008-09
Edition). Immediately repair, replace or clean damaged, defaced or dirty devices. Traffic control devices shall not be cleaned while installed/used. Use of warning lights on any temporary traffic control device shall be prohibited, with the exception of the trailer mounted portable regulatory signs.

Employ an approved independent Channelizing Device Supplier (CDS) to provide and maintain the condition of the following non-fixed channelizing devices: drums, cones, vertical panels, barricades, tubular markers, and longitudinal channeling devices. Cones may be provided and maintained by the Contractor.

The CDS shall not be affiliated with the Contractor and shall be approved by the Engineer in accordance with 102-9.1.1. The CDS shall submit a monthly certification on letterhead that the channelizing devices mentioned above installed/used within the work zone meet acceptable standards as outlined in ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The certification shall include the following statement, "I certify that I have provided and maintained the following devices <list devices covered under the certification> in accordance with the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features." If the Contractor chooses to provide and maintain cones, the Contractor shall submit a monthly certification on a City approved form that all cones installed/used within the work zone meet acceptable standards as outlined in ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features, and the CDS shall submit the monthly certification for any other channelizing devices installed/used within the work zone.

102-9.1.1 Approved Independent Channelizing Device Supplier (CDS) Requirements: Submit the following documents to the Engineer for independent CDS approval at the preconstruction conference. CDSs may elect to provide a one-time submittal of this information for approval and have the information posted on the State Construction Office website for use by City personnel. Inform the Engineer at the preconstruction conference of this approval.

1. A letter on company letterhead signed and dated by the owner of the company or company officer with the following information and statements:

a. The company's owners, stockholders, and officers.

b. A statement declaring that the company will not perform as a CDS on any project where there is common ownership, directly or indirectly, between the company and the Contractor.

c. A statement declaring that the company will furnish and maintain the condition of all channelizing devices with the exception of cones as required in 102- 9.1 with its own forces.

d. A statement declaring at least five years of experience in providing channelizing device supplier services, with its own inventory of channelizing devices.

e. On a separate sheet, list a sample project history of the company's experience as a channeling device supplier for the five years declared in item 1(d) above including the following information:

1. Project name and number and a brief description of CDS work performed,
2. Beginning and ending date of CDS project activities,
3. Location of project (city, state),

4. Monetary amount of CDS work on project,

5. Owner of project, contact person and phone number with area code,

6. Name of Contractor (client) that the work was performed for and phone number with area code.

2. A maintenance plan for approval by the City that outlines the frequency and methods for maintaining the condition of all channelizing devices, except cones owned and maintained by the Contractor, installed/used in the work zone.

102-9.2 Work Zone Signs: Furnish, install, maintain, remove and relocate signs in accordance with the Plans and Design Standards, Index No. 600. Use signs that meet the material and process requirements of Section 994. Use Type IV sheeting for fluorescent orange work zone signs. Roll-up signs must meet the requirements of Type VI sheeting. Use Type IV or Type XI sheeting for all other work zone signs. Attach the sign to the sign support using hardware meeting the manufacturer's recommendations on the APL vendor drawings or as specified in the Design Standards.

102-9.2.1 Post Mounted Signs: Meet the requirements of 990-8.

102-9.2.2 Portable Signs: Use only approved systems, which includes sign stands and attachment hardware (nuts, bolts, clamps, brackets, braces, etc.), meeting the vendor requirements specified on the APL drawings. Provide Federal Highway Administration's (FHWA) accepted sign substrate for use with accepted sign stands on the National Highway System (NHS) under the provisions of the NCHRP Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

102-9.2.3 Barrier Mounted Signs: If post mounting criteria cannot be achieved in accordance with Design Standards, Index No. 600 and a barrier or traffic railing exists, use temporary sign criteria provided in Design Standards, Index No. 11871.

102-9.3 Business Signs: Provide and place signs in accordance with the Plans and Design Standards, Index No. 600 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.4 Project Information Signs: Provide and place signs in accordance with the Plans and Design Standards, Index No. 600 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.5 Channelizing Devices: Furnish and install channelizing devices in accordance with the Plans and Design Standards.

102-9.5.1 Retroreflective Collars for Traffic Cones: Use collars for traffic cones listed on the APL that meet the requirements of Section 990. Use cone collars at night designed to properly fit the taper of the cone when installed. Place the upper 6 inch collar a uniform 3-1/2 inches distance from the top of the cone and the lower 4 inch collar a uniform 2 inches distance below the bottom of the upper 6 inch collar. Collars are to be capable of being removed for temporary use or attached permanently to the cone in accordance with the manufacturer's recommendations. Provide a white sheeting having a smooth outer surface and that has the property of a retroreflector over its entire surface.

102-9.5.2 Longitudinal Channelizing Devices (LCDs): Use LCDs listed and categorized on the APL as vehicular, pedestrian or vehicular/pedestrian. Retroreflective sheeting must meet the requirements of Section 990. LCDs must be interlocked except for the stand-alone unit placed

perpendicular to a sidewalk. For LCDs requiring internal ballasting, an indicator that clearly identifies the proper ballast level will be required.

Use alternating orange and white solid color vehicular LCDs. Vehicular LCDs may be substituted for drums, vertical panels, or barricades.

102-9.6 Barrier Wall (Temporary): Furnish, install, maintain, remove and relocate temporary barrier wall in accordance with the Plans. Obtain and use precast temporary barrier wall from a manufacturing plant that is on the City's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. Temporary barrier wall must meet the material and construction requirements of Section 521 unless noted otherwise in the Design Standards.

The maximum allowable height increase between consecutive temporary barrier wall units in the direction of traffic is 1 inch.

Temporary concrete barrier wall used on roadway sections must comply with Design Standards, Index Nos. 412, 415 or 414. Temporary concrete barrier wall used on bridge and wall sections, shall comply with Design Standards, Index No 414.

Temporary water filled barrier wall used on roadway sections shall meet the NCHRP Report 350 or MASH criteria and be listed on the APL.

Barriers meeting the requirements of Design Standards, Index Nos. 412, 415 or temporary water filled barriers on the APL will not be accepted as an alternate to barriers meeting the requirements of Design Standards, Index No. 414.

Trailer mounted barriers listed on the APL may be used at the option of the Contractor. Trailer mounted barriers listed on the APL must have an FHWA eligibility letter and be successfully crash tested in accordance with MASH TL-3 criteria. All trailer mounted barriers must be equipped with an APL listed truck mounted attenuator, an APL listed vehicle mounted arrow board and vehicle warning lights in accordance with this Section.

102-9.6.2.1 Temporary Barrier Wall Meeting the Requirements of Design Standards, Index Nos. 412 and 414: Ensure the marking requirements of the respective Index are met.

102-9.6.2.2: Proprietary Precast Temporary Barrier Wall Fabricated prior to 2005: The Contractor must submit a certification stating that all unmarked barrier wall units meet the requirements of the Specifications and the Design Standards. Certifications will be project specific and non-transferable

102-9.6.2.3 Proprietary Precast Temporary Barrier Wall Fabricated in 2005 or later: Ensure each wall unit has permanent clear markings, showing the manufacture date, serial number, manufacturer's name or symbol, and the APL number. Label the markings on a plate, plaque, or cast in the unit. Proprietary barrier wall fabricated prior to 2016 and marked with the "INDX 521" in lieu of the APL number will be permitted.

102-9.7 Barrier Delineators: Install barrier delineators on top of temporary barrier wall and vehicular LCDs meeting the requirements of the Design Standards and Section 705.

102-9.8 Glare Screen (Temporary): Use temporary glare screens listed on the APL that meet the requirements of Section 990. Furnish, install, maintain, remove and relocate glare screen systems in conjunction with temporary barrier wall at locations identified in the Plans.

The anchorage of the glare screen to the barrier must be capable of safely resisting an equivalent tensile load of 600 pounds per foot of glare screen, with a requirement to use a minimum of three fasteners per barrier section.

When glare screen is utilized on temporary barrier wall, barrier delineators will not be required.

102-9.9 Temporary Crash Cushion (Redirective/Gating): Furnish, install, maintain and subsequently remove temporary crash cushions in accordance with the details and notes shown in the Plans, the Design Standards, and requirements of the pre-approved alternatives listed on the APL. Delineate the crash cushion in accordance with Section 544. Maintain the crash cushions until their authorized removal. Repair all attachment scars to permanent structures and pavements after crash cushion removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the City. Restore crash cushions damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

102-10 Guardrail (Temporary): Furnish guardrail (temporary) in accordance with the Plans and Design Standards. Meet the requirements of Section 536.

102-11 Arrow Board: Furnish arrow boards that meet the requirements of Section 990 as required by the Plans and Design Standards to advise approaching traffic of lane closures or shoulder work. Type B arrow boards may be used on low to intermediate speed (0 mph to 50 mph) facilities or for maintenance or moving operations on any speed facility. Type C arrow boards shall be used for all other operations on high-speed (50 mph and greater) facilities and may be substituted for Type B arrow boards on any speed facility.

102-9.12 Portable Changeable Message Sign (PCMS): Furnish PCMSs or truck mounted changeable message signs that meet the requirements of Section 990 as required by the Plans and Design Standards to supplement other temporary traffic control devices used in work zones.

102-9.13 Portable Regulatory Signs (PRS): Furnish PRSs that meet the requirements of 990 as required by the Plans and Design Standards.

Activate portable regulatory signs only during active work activities and deactivate when no work is being performed.

102-9.14 Radar Speed Display Unit (RSDU): Furnish RSDUs that meet the requirements of Section 990 as required by the Plans and Design Standards to inform motorists of the posted speed and their actual speed.

Activate the radar speed display unit only during active work activities and deactivate when no work is being performed.

102-9.15 Temporary Signalization and Maintenance: Provide temporary signalization and maintenance at existing, temporary, and new intersections including but not limited to the following:

1. Installation of temporary poles and span wire assemblies as shown in the Plans,
2. Temporary portable traffic signals as shown in the Plans,
3. Adding or shifting signal heads,
4. Trouble calls,
5. Maintaining intersection and coordination timing and preemption devices. Coordination timing will require maintaining functionality of system communications.

Restore any loss of operation within 12 hours after notification.

Provide traffic signal equipment that meets the requirements of the Design Standards and 603-2. The Engineer may approve used signal equipment if it is in acceptable condition. Replacement components for traffic signal cabinet assemblies will be provided by the maintaining agency.

102-9.16 Temporary Traffic Detection and Maintenance: Provide temporary traffic detection and maintenance at existing, temporary, and new signalized intersections. Provide temporary traffic detection equipment listed on the APL. Restore any loss of detection within
12 hours. Ensure 90% accuracy per signal phase, measured at the initial installation and after any lane shifts, by comparing sample data collected from the detection system with ground truth data collected by human observation. Collect the sample and ground truth data for a minimum of five minutes during a peak and five minutes during an off-peak period with a minimum three detections for each signal phase. Perform the test in the presence of the Engineer.

102-9.17 Truck Mounted Attenuators and Trailer Mounted Attenuators: Furnish, install and maintain only those attenuators that meet the requirements of NCHRP 350 or the MASH.

Use truck mounted attenuators or trailer mounted attenuators, when called for in the Design Standards. Use attenuators listed on the APL.

When attenuators are called for, use either a truck mounted attenuator or a trailer mounted attenuator system designed and installed in accordance with the manufacturers recommendations.

Equip the attenuator cartridge with lights and reflectors in compliance with applicable Florida motor vehicle laws, including turn signals, dual tail lights, and brake lights. Ensure that lights are visible in both the raised and lowered positions if the unit is capable of being raised.

Install either alternating black with yellow or white with orange sheeting on the rear of trailer mounted attenuators and on truck mounted attenuators, in both the operating and raised position. Use Type III (work zone) or Type IV sheeting consisting of 4 or 6 inch wide stripes installed to form chevrons that point upward. All sheeting except black shall be retroreflective.

Attenuators will not be paid for separately. Include the cost of the truck with either a truck mounted attenuator or a trailer mounted attenuator in MOT Lump Sum. Payment includes all costs, including furnishing, maintaining and removal when no longer required, and all materials, labor, tools, equipment and incidentals required for attenuator maintenance.

102-9.18 Temporary Raised Rumble Strip Set: Furnish, install, maintain, remove, and reinstall temporary raised rumble strips per the manufacturer's recommendations and in accordance with Design Standards, Index No. 603.

The temporary raised rumble strip may be either a removable polymer striping tape or a molded engineered polymer material.

102-9.19 Automated Flagger Assistance Devices (AFAD): Furnish, install, maintain, remove, and relocate AFADs in accordance with the Plans, Design Standards, Index No. 603, and APL vendor drawings. Manufacturers seeking evaluation of their product for the APL must submit an application in accordance with Section 6 and include detailed vendor drawings showing typical application of the device in accordance with Design Standards, Index No.603.

Position AFADs where they are clearly visible to oncoming traffic. AFADs may be placed on the centerline if they have been successfully crash tested in accordance with MASH TL-3 criteria. A gate arm is required in accordance with Section 990 if a single AFAD is used on the shoulder to control one direction of traffic.

The devices may be operated either by a single flagger at one end of the traffic control zone, from a central location, or by a separate flagger near each device location. Use only flaggers trained in accordance with Section 105 and in the operation of the AFAD. When in use, each AFAD must be in view of, and attended at all times by, the flagger operating the device.

Provide two flaggers on-site and use one of the following methods in the deployment of AFADs:

1. Place an AFAD at each end of the temporary traffic control zone, or
2. Place an AFAD at one end of the temporary traffic control zone and a flagger at the opposite end.

A single flagger may simultaneously operate two AFADs as described in (1) or a single AFAD as described in (2) if all of the following conditions are met:

1. The flagger has an unobstructed view of the AFAD(s),
2. The flagger has an unobstructed view of approaching traffic in both directions,
3. For two AFADs, the AFADs are less than 800 feet apart. For one AFAD, the AFAD and the flagger are less than 800 feet apart.
4. Two flaggers are available on-site to provide normal flagging operations should an AFAD malfunction.

AFADs may be either a remotely controlled Stop/Slow AFAD mounted on either a trailer or a movable cart system, or a remotely controlled Red/Yellow Lens AFAD.

Illuminate the flagging station when the AFAD is used at night. When the AFAD is not in use, remove or cover signs and move the AFAD device outside the clear zone or shield it with a barrier.

AFADs will not be paid for separately. AFADs may be used as a supplement or an alternate to flaggers in accordance with the Plans, Design Standards, Index No. 603, and the APL vendor drawings. Include the cost for AFADs in Maintenance of Traffic Lump Sum.

102-9.20 Temporary Lane Separator: Furnish, install, maintain, remove and relocate temporary lane separator in accordance with the Plans and Design Standards, Index No 600. Anchor the portable temporary lane separator with a removable anchor bolt. Use epoxy on bridge decks where anchoring is not allowed. Remove the epoxy from the bridge deck by hydroblasting or other method approved by the Engineer.

102-10 Work Zone Pavement Marking.

102-10.1 Description: Furnish and install standard paint for MOT in construction areas and in close conformity with the lines and details shown in the Plans and Design Standards.

Centerlines, lane lines, edge lines, stop bars, crosswalks, and turn arrows will be required in work zones prior to opening the road to traffic.

102.10.2 Painted Pavement Markings:

102-10.2.1 General: Use painted pavement markings meeting the requirements of Section 710. Use standard paint unless otherwise identified in the Plans or approved by the Engineer.

102-10.3 Removable Tape:

102-10.3.1 General: Use removable tape listed on the APL as shown in the Plans and meeting the requirements of 990-4.

102-10.3.2 Application: Apply removable tape with a mechanical applicator to provide pavement lines that are neat, accurate and uniform. Equip the mechanical applicator with a film cut-off device and with measuring devices that automatically and accumulatively measure the length of each line placed within an accuracy tolerance of plus or minus 2%. Ensure removable tape adheres to the road surface. Removable tape may be placed by hand on short sections, 500 feet or less, if it is done in a neat accurate manner.

102-10.3.3 Retroreflectivity: Apply white and yellow pavement markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m^2 for white and contrast markings and not less than 250 mcd/lx·m^2 for yellow markings. Black portions of contrast tapes and black masking tapes must be non-reflective and have a reflectance of less than 5 mcd/lx m^2. At the end of the six month service life, the retroreflectance of white and yellow removable tape shall not be less than 150 mcd/lx·m^2.

102-10.3.4 Removability: Provide removable tape capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips, either manually or by a mechanical roll-up device, at temperatures above 40ºF, without the use of heat, solvents, grinding or blasting.

102-10.4 Temporary Retroreflective Pavement Markers (RPM's): Use Class B RPMs for all locations, except centerline rumble striping operations, where Class D and Class B RPMs are required. All markers must be listed on the APL. Install all markers in accordance with the manufacturer's recommendations and in accordance with Design Standards, Index Nos. 519, 600, and 17352, prior to opening the road to traffic. After initial installation, replace markers any time more than three consecutive markers fail or are missing at no expense to the City.

102-11 Method of Measurement.

102-11.1 General: Devices installed/used on the project on any calendar day or portion thereof, within the Contract Time, including time extensions which may be granted, will be paid for at the Contract unit price for the applicable pay item, except those paid for as Lump Sum.

102-11.2 Traffic Control Officers: The quantity to be paid for will be at the Contract unit price per hour (4 hour minimum) for the actual number of officers certified to be on the project site, including any law enforcement vehicles and all other direct and indirect costs. Payment will be made only for those traffic control officers specified in the Plans and authorized by the Engineer.

102-11.3 Special Detours: When a diversion or lane shift that requires temporary pavement is shown in the Plans, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for as a special detour. However, traffic control devices, warning devices, barriers, signing, pavement markings, and restoration to final configuration will be paid for under their respective pay items.

When the Plans show more than one special detour, each special detour will be paid for separately, at the Contract lump sum price for each.

102-11.4 Commercial Material for Driveway Maintenance: The quantity to be paid for will be the certified volume, in cubic yards, of all materials authorized by the Engineer, acceptably placed and maintained for driveway maintenance. The volume, which is authorized to be reused, and which is acceptably salvaged, placed, and maintained in other designated driveways will be included again for payment.

102-11.5 Work Zone Signs: The number of temporary post-mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for work zone signs. When multiple signs are located on single or multiple posts, each sign panel will be paid individually. Signs greater than 20 square feet and detailed in the Plans will be paid for under Lump Sum MOT.

Temporary portable signs (excluding mesh signs) and vehicular mounted signs will be included for payment under work zone signs, only if used in accordance with the Design Standards.

The number of temporary barrier mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for barrier mounted work zone signs.

102-11.6. Business Signs: The number of business signs certified as installed/used on the project will be paid for at the Contract unit price for business signs.

102-11.7 Project Information Signs: No separate payment will be made for project information signs. Payment will be included under Lump Sum MOT.

102-11.8 Channelizing Devices: The number of drums, vertical panels, pedestrian LCDs, and Type I, Type II, Type III, or direction indicator barricades, certified as installed/used on the project meeting the requirements of Design Standards, Index No. 600 and have been properly maintained will be paid for at the Contract unit prices for channelizing device. Payment for vehicular LCDs will be paid as the length in feet installed divided by the device spacing for barricades, vertical panels, and drums and certified as installed/used on the project meeting the requirements of Design Standards, Index No. 600 and have been properly maintained will be paid for at the Contract unit price for channelizing device. Payment will not be made for channelizing devices unsatisfactorily maintained, as determined by the Engineer. Payment will be made for each channelizing device that is used to delineate trailer mounted devices. Payment will be made for channelizing devices delineating portable changeable message signs during the period beginning 14 working days before Contract Time begins as authorized by the Engineer.

102-11.9 Barrier Wall (Temporary): The Contract unit price for barrier wall (temporary) will be full compensation for furnishing, installing, maintaining, and removing the barrier wall. When called for, the Contract unit price for barrier wall (temporary/relocate) will be full compensation for relocating the barrier. The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.10 Barrier Delineators: No separate payment will be made for barrier delineators installed on top of temporary barrier wall and vehicular LCDs.

102-11.11 Glare Screen (Temporary): The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.12 Temporary Crash Cushions:

102-11.12.1 Redirective: The quantity to be paid for will be the number of temporary crash cushions (redirective) certified as installed/used and maintained on the project, including object marker.

102-11.12.2 Gating: The quantity to be paid for will be the number of temporary crash cushions (gating) certified as installed/used and maintained on the project, including object marker.

102-11.13 Temporary Guardrail: The quantity to be paid for will be the length, in feet, of temporary guardrail constructed and certified as installed/used on the project. The length of a run of guardrail will be determined as a multiple of the nominal panel lengths.

102-11.14 Arrow Board: The quantity to be paid at the contract unit price will be for the number of arrow boards certified as installed/used on the project on any calendar day or portion thereof within the Contract Time.

102-11.15 Portable Changeable Message Sign: The quantity to be paid at the Contract unit price will be for the number of PCMSs or truck mounted changeable message signs certified as installed/used on the project on any calendar day or portion thereof within the Contract Time. Payment will be made for each portable changeable message sign that is used during the period beginning fourteen working days before Contract Time begins as authorized by the Engineer.

102-11.16 Portable Regulatory Signs: The quantity to be paid for will be the number of portable regulatory signs certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for portable regulatory sign.

102-11.17 Radar Speed Display Unit: The quantity to be paid for will be the number of radar speed display units certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for radar speed display unit.

102-11.18 Temporary Signalization and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the full duration of the Contract. For temporary intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the duration of the temporary intersection. No separate payment will be made for temporary signalization and maintenance at new intersections.

102-11.19 Temporary Traffic Detection and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day Contract Time begins and ending the day the permanent detection is operational and the final lane configuration is in place. For temporary and new intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day the temporary detection is functional and ending the day: the permanent detection is operational and the final lane configuration is in place for a new intersection; or, when the detection is removed for a temporary intersection.

102-11.20 Work Zone Pavement Markings: The quantities of work zone pavement markings authorized and acceptably applied under this Section and certified as installed/used on the project, will be paid for as follows:

1. The length in gross miles, of solid, 10’-30’ skip, 3’-9’ dotted, 6’-10’ dotted, and 2’-4’ dotted lines.

The gross mile measurement will be taken as the distance from the beginning of the painted line to the end of the painted line and will include the unmarked gaps for skip and dotted lines. The gross mile measurement will not include designated unmarked lengths at intersections, turn lanes, etc. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

2. The length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.

3. The number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of “points” or directions.

4. The number of temporary RPM’s authorized and acceptably applied.

102-11.21 Temporary Raised Rumble Strips: The quantity to be paid for will be the number of calendar days, or portions thereof, that temporary raised rumble strips are certified as installed/used on the project within the Contract Time. The number of strips used must meet the requirements of the Design Standards, Index No. 603. No adjustment will be made to the per day measurement for the number of strips or sets used, or for the number of times the sets are relocated.

102-11.22 Temporary Lane Separator: The quantity to be paid for will be the field measure, in feet, of temporary lane separator certified as installed/used on the project, including drainage gaps, completed and accepted.

102-12 Submittals.

102-12.1 Submittal Instructions: Prepare a certification of quantities, using the City's current approved form, for certified MOT payment items for each project in the Contract. Submit the certification of quantities to the Engineer. The City will not pay for any disputed items until the Engineer approves the certification of quantities.

102-12.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

2. The basis for arriving at the amount of the progress certification, less payment previously made and less an amount previously retained or withheld. The basis will include a detail breakdown provided on the certification of items of payment in accordance with 102-13. After the initial setup of the MOT items and counts, the interval for recording the counts will be made weekly on the certification sheet unless there is a change. This change will be documented on the day of occurrence. Some items may necessitate a daily interval of recording the counts.

102-13 Basis of Payment.

102-13.1 Maintenance of Traffic (General Work): When an item of work is included in the proposal, price and payment will be full compensation for all work and costs specified under this Section except as may be specifically covered for payment under other items.

102-13.2 Traffic Control Officers: Price and payment will be full compensation for the services of the traffic control officers.

102-13.3 Special Detours: Price and payment will be full compensation for providing all detour facilities shown in the Plans and all costs incurred in carrying out all requirements of this Section for general MOT within the limits of the detour, as shown in the Plans.

102-13.4 Commercial Materials for Driveway Maintenance: Price and payment will be full compensation for all work and materials specified for this item, including specifically all required shaping and maintaining of driveways.

102-13.5 Work Zone Signs: Price and payment will be full compensation for all work and materials for furnishing signs, supports and necessary hardware, installation, relocating, maintaining and removing signs.

102-13.6. Business Signs: Price and payment will be full compensation for all materials and labor required for furnishing, installing, relocating, maintaining, and removing the signs as well as the cost of installing any logos provided by business owners.

102-13.7 Project Information Signs: Price and payment will be full compensation for all materials and labor for furnishing, installing, relocating, maintaining and removing signs.

102-13.8 Channelizing Devices: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the channelizing devices.

102-13.9 Barrier Wall (Temporary): Price and payment will be full compensation for furnishing, installing, maintaining, and removing the barrier. When called for, barrier wall (temporary) (relocate) will be full compensation for relocating the barrier.

102-13.10 Barrier Delineators: Price and payment will be full compensation for furnishing, installing and maintaining the barrier delineators.

102-13.11 Glare Screen (Temporary): Price and payment will be full compensation for furnishing, installing, maintaining, and removing the glare screen certified as installed/used on the project. When called for, glare screen (relocate) will be full compensation for relocating the glare screen.

102-13.12 Temporary Crash Cushion (Redirective/Gating): Price and payment will be full compensation for furnishing, installing, maintaining and subsequently removing such crash cushions.

102-13.13 Temporary Guardrail: Price and payment will be full compensation for furnishing all materials required for a complete installation; including end anchorage assemblies and any end connections to other structures and for installing, maintaining and removing guardrail.

102-13.14 Arrow Board: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing arrow boards.

102-13.15 Portable Changeable Message Sign: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable changeable message signs.

102-13.16 Portable Regulatory Signs: Price and payment will be full compensation for furnishing, installing, relocating, maintaining and removing a completely functioning system as described in these Specifications portable regulatory signs. Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable regulatory signs.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and/or MOT operations.

102-13.17 Radar Speed Display Unit: Price and payment will be made only for a completely functioning system as described in these specifications. Payment will include all labor, hardware, accessories, signs, and incidental items necessary for a complete system. Payment will include any measurements needed to insure that the unit conforms to all specification requirements.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and/or MOT operations. Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing radar speed display unit.

102-13.18 Temporary Signalization and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic control signals including all equipment and components necessary to provide an operable traffic signal. Payment will be withheld for each day at each intersection where the temporary signalization is not operational within 12 hours after notification.

102-13.19 Temporary Traffic Detection and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic detection including all equipment and components necessary to provide an acceptable signalized intersection. Take ownership of all equipment and components. Payment will be withheld for each day at each intersection where the temporary detection is not operational within 12 hours after notification.

102-13.20 Work Zone Pavement Markings: Price and payment will be full compensation for all work specified including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and

equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Removable tape may be substituted for standard paint at no additional cost to the City.

Payment for temporary RPMs used to supplement line markings will be paid for under temporary retroreflective pavement markers. Install these markers as detailed in the Design Standards.

102-13.21 Temporary Raised Rumble Strips: Price and payment will be full compensation for all work and materials described in this Section, including all cleaning and preparing of surfaces, disposal of all debris, furnishing of all materials, application, curing, removal, reinstalling and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work.

102-13.22 Temporary Lane Separator: Price and payment will be full compensation for all work specified in this Section.

102-13.23 Payment Items: Payment will be made under:

Item No. 102- 1- Maintenance of Traffic - lump sum.
Item No. 102- 2- Special Detour - lump sum.
Item No. 102- 3- Commercial Material for Driveway Maintenance - per cubic yard.
Item No. 102- 14- Traffic Control Officer - per hour.
Item No. 102- 60- Work Zone Sign - per each per day.
Item No. 102- 61- Business Sign - each.
Item No. 102- 62- Barrier Mounted Work Zone Sign – per each per day
Item No. 102- 71- Barrier Wall - per foot.
Item No. 102- 75- Temporary Lane Separator - per foot
Item No. 102- 94- Glare Screen - per foot.
Item No. 102- 73- Guardrail (Temporary) - per foot.
Item No. 102- 74- Channelizing Devices - per each per day.
Item No. 102- 76- Arrow Board - per each per day.
Item No. 102- 78- Temporary Retroreflective Pavement Markers - each.
Item No. 102- 81- Crash Cushion (Gating) (Temporary) - per location.
Item No. 102- 89- Crash Cushion (Redirective) (Temporary) - per location.
Item No. 102- 99- Portable Changeable Message Sign (Temporary) - per each per day.
Item No. 102-104-Temporary Signalization and Maintenance - per intersection per day.
Item No. 102-107- Temporary Traffic Detection and Maintenance - per intersection per day.
Item No. 102-150- Portable Regulatory Sign - per each per day.
Item No. 102-150- Radar Speed Display Unit - per each per day.
Item No. 102-909- Temporary Raised Rumble Strips - per day.
Item No. 102-911-Removable Tape (White/Black) - per gross mile.
Item No. 102-912-Removable Tape (Yellow) - per gross mile.
Item No. 710- Painted Pavement Markings.
Item No. 711- Thermoplastic Pavement Markings.

SECTION 630 - CONDUIT

630-1 Description.

Furnish and install conduit for traffic control signals and devices, highway lighting, and other electrically powered or operated devices as shown in the Contract Documents.

630-2 Materials.

630-2.1 Conduit: Use materials that have been tested and listed by a Nationally Recognized Testing Laboratory to the following industry standards:

Schedule 40 and 80 Polyvinyl Chloride (PVC)[1]..... UL 651
Fiberglass Reinforced Epoxy[2]..... UL 2420
Intermediate Metal[3]..... UL 1242
Rigid Galvanized Metal[3,4]..... UL 6
Rigid Aluminum[4]..... UL 6A
PVC Coated Intermediate Metal[4]..... ASTM A135/A135M,
..... ASTM A513, ASTM A568/A568M, NEMA RN1-2005
Liquid Tight Flexible Metal..... UL 360
High Density Polyethylene (HDPE) Standard Dimension
Ratio (SDR) 9-11[5]..... ASTM F2160
HDPE SDR 13.5[5]..... ASTM F2160, NEMA TC-7
Schedule 40 and 80 HDPE..... UL 651A

1. Use conduit with solvent weld slip-fit plastic couplings unless approved by the Engineer.

2. Use conduit having a minimum stiffness value of 250. Ensure that each section has a duct bell with an integral gasket on one end and a duct spigot on the other end.

3. Use conduit that is hot-dipped galvanized with a minimum coating of 1.24 ounces per square foot on both the inside and outside of the conduit. The weight of the zinc coating shall be determined using ASTM A90.

4. Use conduit with both ends reamed and threaded.

5. Can be used with preassembled cable and rope-in-conduit.

630-2.2 Locate Wire: Ensure that locate wire is a single copper conductor with a minimum gauge of No. 12 AWG. Ensure locate wire is insulated using a 45 mil minimum thickness polyethylene sheath that is orange in color and marked to identify the manufacturer and the conductor size.

630-2.3 Locate Wire Grounding Unit: Ensure that locate wires are attached to a wire grounding unit (WGU) dedicated to safely dissipate high transient voltages or other foreign electrical surges induced into the designated system. Ensure the WGU conforms to the following:

1. Allows signals generated by locate system transmitters to pass through the protection system without going to ground.

2. The protection system automatically resets and passes locate system transmitter signals after the unit has been grounded to dissipate over-voltages.

3. Is intended for below or above grade applications. Ground the WGU to a driven rod within 10 feet of the system using a No. 6 AWG single conductor wire with green insulation. Ensure that the WGU is enclosed for protection from environmental hazards and is accessible for the connection of portable locate system transmitters.

4. The WGU system meets the minimum standards listed in Table 1 for surge protection:

Table 1: Minimum Standards for Surge Protection	
Surge Element	3-element maximum duty fail-safe gas tube.
Rating	40,000 A surge capacity (single-cycle, 8 by 20 microsecond waveform).
Life	Minimum 1,000 surges (1000 A to ground).
Fail-Safe	Integral fail-shorted device.
Insulation	1,000 megohm minimum at 100 volts of direct current (V_{DC}).
Clamp Voltages	a. Impulse at 100 volts per microsecond: Typically 500 volts. b. Direct Current: 300 to 500 volts.

630-2.4 Warning Tape: Ensure that the buried cable warning tape is flexible, elastic material 3 inches wide, 6 mil thick, intended for burial and use as an underground utility warning notice, and that the surface of the warning tape is coated and sealed to prevent deterioration caused by harsh soil elements. Ensure that the warning tape color follows the American Public Works Association color code for underground utilities and has the repeating message "CAUTION: FDOT CABLE," or other wording approved by the Engineer, permanently printed on its surface. Ensure that the tape material and ink colors do not change when exposed to acids, alkalis, and other destructive chemical variances commonly found in Florida soils.

630-2.5 Route Markers: Route markers may be either a standard route marker (SRM) type or an electronic route marker (ERM) type. Ensure the SRM is a rigid, tubular, driven post used for location and notification purposes only. Ensure the ERM is physically identical to the SRM, but also includes a termination board to provide aboveground access to locate wire buried alongside conduit and cable runs.

Ensure that each SRM is labeled and identified as an FDOT fiber optic cable marker unless otherwise shown in the Plans. The labels must include the City's logo, contact information for the local FDOT District, and a telephone number to call prior to any excavation in the area. Ensure that the identification information is permanently imprinted on the top fitting, and will not peel, fade, or deteriorate.

630-2.5.1 Standard Route Marker (SRM): Ensure that SRM posts are white with an orange top fitting cover with black or white lettering and graphics. Ensure that the SRM is a tubular configuration, and both the marker post and the top fitting are made from virgin Type 111 HDPE. Ensure that any fasteners used with the SRM are constructed of stainless steel.

Ensure that all SRMs have a minimum outside diameter of 3.5 inches with a minimum wall thickness of 0.125 inches. Ensure that the top fitting cover is a minimum of 1.5 feet long and has an outside diameter of 3.75 inches with a minimum wall thickness of 0.125 inches. Ensure that each SRM provides a tensile strength of 4,200 pounds per square inch as required in ASTM D638. Ensure that each SRM is manufactured for use in temperatures range of minus 30° to 165°F in accordance with NEMA TS 2.

Ensure the SRM can withstand an impact force of 70 pounds per foot at 32°F in accordance with ASTM D2444, before and after UV conditioning for 2,000 hours in accordance with ASTM G154. Ensure that the control sample of any material tested maintains a minimum of 70 percent of its original tensile strength.

Ensure that SRMs installed at the minimum 2 foot depth can withstand at least one impact at 45 miles per hour by a vehicle weighing at least 3,500 pounds and that after impact, post returns to an upright position within 10 degrees of vertical alignment within 30 seconds from the time of impact.

630-2.5.2 Electronic Route Marker (ERM): Ensure ERMs meet the same material and performance requirements as the SRMs with the following exceptions. Equip each ERM with a removable, top-fitting cover that is black with white lettering. Ensure that each ERM contains a terminal board equipped with locate wire and ground connectors.

Ensure that the terminal board is made from corrosion-resistant materials and includes terminal facilities labeled according to function and provides uniform spacing between connection points.

630-3 Installation Requirements.

630-3.1 General: Install the conduit in accordance with NEC or National Electrical Safety Code (NESC) requirements and the Design Standards. Consider the locations of conduit as shown in the Plans as approximate. Construct conduit runs as straight as possible, and obtain the Engineer's approval for all major deviations in conduit locations from those shown in the Plans. Include buried cable warning tape with all trenched conduit. Mark the location of the conduit system with route markers as shown in the Plans and approved by the Engineer. Ensure that all route markers used are new and consistent in appearance.

For conduit installed by directional bore, install in accordance with Section 555. For conduit installed by jack and bore, install in accordance with Section 556.

Use only intermediate metal conduit, rigid galvanized metal conduit, rigid aluminum conduit or PVC coated intermediate metal conduit for above-ground electrical power service installations and rigid galvanized metal conduit or rigid aluminum conduit for underground electrical power service installations. Meet the requirements of Section 562 for coating all field cut and threaded galvanized pipe.

Use Schedule 80 PVC or fiberglass reinforced epoxy conduit in structural elements in or on bridge decks.

Use HDPE with an SDR number less than or equal to 11, Schedule 80 PVC or Schedule 40 PVC for underground installations in earth or concrete for ITS and traffic control signal applications, except, use only HDPE with an SDR number less than or equal to 11 for blown fiber optic cable installations on limited access facilities.

Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, or Schedule 40 PVC for underground installations of electrical conduit in earth for lighting applications and landscape irrigation applications.

Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, Schedule 40 PVC, or rigid galvanized metal for underground installations of electrical conduit in concrete for lighting applications.

Do not place more than the equivalent of three quarter bends or 270 degrees of bends, including the termination bends, between the two points of termination in the conduit, without a pull box. Obtain the Engineer's approval to use corrugated flexible conduits for short runs of 6 feet or less.

When a conduit installation changes from underground to above-ground, make the change a minimum of 6 inches below finished grade.

Install a No. 12 AWG pull wire or polypropylene cord inside the full length of all conduits. Ensure that a minimum of 24 inches of pull wire/cord is accessible at each conduit termination.

Ensure the conduit includes all required fittings and incidentals necessary to construct a complete installation.

When earth backfill and tamping is required, place backfill material as per Section 120 in layers approximately 12 inches thick, and tamp each layer to a density equal to or greater than the adjacent soil.

When backfilling trenches in existing pavement, use a flowable fill meeting the requirements of Section 121.

Provide a standard clearance between underground control cable and electrical service cable or another parallel underground electrical service cable that meets NESC requirements.

Prevent the ingress of water, dirt, sand, and other foreign materials into the conduit prior to, during, and after construction. Seal the ends of conduit after wiring is complete with a moisture resistant sealant that is designed for this specific application.

630-3.1.1 Fiber Optic Cable Conduit: Install the conduit system so the fiber optic cable maintains a minimum bend radius of 20 times the cable diameter. Use approved methods for connecting inner duct or conduit within or between plowed portions, trenched portions, and bored portions. Submit the conduit manufacturer's coupling method and material to the Engineer for approval.

630-3.2 Conduit Sizes: Size the conduit to be used on all installations, unless otherwise shown in the Contract Documents. Use conduit of sufficient size to allow the conductor to be installed without any damage and meeting NEC requirements. Use conduit that is at least 2 inches in diameter, with the following exceptions:

For conduit protecting the ground wire on the side of a pole, use conduit that is at least 1/2 inch in diameter.

For ITS applications where Contractor chooses to install fiber optic cable by blowing, use conduit that is at least 1-1/4 inch in diameter.

For traffic control signal and device electrical service conduit, use the minimum conduit size required by the local maintaining agency and the electrical service provider.

630-3.3 Conduit Joints: Make conduit joints using materials as specified by the manufacturer. When conduit crosses an expansion joint of a structure and where shown in the Plans, install an expansion or expansion/deflection fitting as specified by the manufacturer. Certify that expansion/deflection fittings are rated to accommodate a minimum rotation of 30 degrees and that both the expansion and expansion/deflection fittings are rated to accommodate the anticipated longitudinal movement (minimum of 2 inches for deflection fittings and 0.7 inches for expansion/deflection fittings). Ensure that all installed joints are waterproof. As an exception to the threaded coupling for intermediate metal conduit, at locations where it is not possible to screw the threaded coupling properly, the Contractor may use a waterproof slip-joint coupling approved by the Engineer. Secure the joint, and tighten threaded connections.

Prior to insertion into the coupling, clean, prime and coat the ends of PVC conduit with solvent-type cement as specified by the manufacturer.

630-3.4 PVC Coating: Apply PVC coating to exposed metal surfaces of the conduit, except for the threads, to attain a nominal thickness of 40 mils. Ensure that the coating is free of sags and drips.

Attach the coupling to the conduit prior to the application of the coating for conduit of 1 inch diameter or less.

Use a coupling with sleeve extensions on conduit larger than 1 inch. Ensure that the sleeve extensions on all threaded female openings have a length equal to the diameter of the conduit up to and including size number 53.

630-3.5 Conduit Terminations: Fit the terminating ends of all metal conduit and metal conduit sleeves with an appropriate bushing.

For conduit to be encased in concrete, wrap with tape or otherwise protect all terminations to prevent the entrance of concrete.

Connect new underground conduits to existing underground conduits with a pull box.

Install conduit terminating in a concrete strain pole through the cable entry hole and up the center of the pole to a location approximately 6 inches below the handhole.

Seal conduits terminating in a controller base, pole, pull box, junction box, or pedestal base with a moisture resistant sealant approved by the Engineer.

For a controller base, pole or pedestal base, and junction boxes, terminate conduit runs into the center of the base or box at least 2 inches above the surface of the base.

630-3.6 Restoration of Trench Areas: Restore the conduit trench construction area to an acceptable condition. Such work includes repair or replacement of all pavement areas, sidewalks, driveways, curbs, structures, landscaping, grass areas (including removal of excavated materials and spoils), removal and disposal of drilling fluids, and backfilling areas disturbed by the conduit installation.

630-3.7 Above-Ground Installation: Use conduit designed and manufactured for use in long-term above-ground applications with UV stabilization to prevent material deterioration. Securely attach above-ground conduit installations to the surface of the supporting structure using conduit straps. As a minimum, use conduit straps located on 5 foot centers. Use galvanized metal conduit straps when installing intermediate metal conduit, fiberglass reinforced epoxy conduit, rigid galvanized conduit, rigid aluminum conduit or PVC coated intermediate metal conduit above ground.

Use the same PVC coating for the metal straps as the conduit, when using PVC coated intermediate metal conduit.

630-3.8 Elbows: The radius of curvature of the centerline of any bend shall not be less than shown below:

Size	Standard Radius
1/2 inch	4 inches
3/4 inch	4-1/2 inches
1 inch	5-1/2 inches
1-1/4 inches	7-1/4 inches
1-1/2 inches	8-1/4 inches
2 inches	9-1/2 inches
2-1/2 inches	10-1/2 inches
3 inches	13 inches

Size	Standard Radius
3-1/2 inches	15 inches
4 inches	16 inches
5 inches	24 inches
6 inches	30 inches

630-3.9 Fiber Optic Cable Locate Wire: Install locate wire in the trench or bore with all underground conduits to provide end-to-end electrical continuity for electronically locating the underground conduit system. Bury locate wire along the centerline of the top outer surface of installed conduit. Do not install locate wire in a conduit with fiber optic cable.

Do not run locate wires into field cabinets. Terminate locate wires at the first and last pull boxes in the conduit run or as shown in the Plans. Ensure that wire termination occurs in a pull box as shown in the Design Standards, Index No. 17700.

In a trenching operation, install the locate wire no more than 3 inches above the conduit. Ensure that the locate wire enters all pull and splice boxes, and that a minimum of 10 feet of slack locate wire is coiled and neatly stored in each box.

In a boring operation, install the locate wire in an encasement, install the conduit detection wire external to the conduit with no separation between conduit and wire, or use conduit with integral locate wire. Locate wire may also be placed in the void between the inner wall of conduit and innerducts contained within the conduit as long as no other cables are present within the void.

Perform continuity tests and insulation resistance tests on all locate wires and provide the Engineer with all test results. Replace, or repair defective locate wire at no additional cost.

Make locate wire splices in a flush grade-level box. Ensure that locate wire splices are waterproof and suitable for direct burial. Ensure that locate wire splices at the pull box meet NEC requirements. Ensure that locate wire splices are constructed of and in the following order: a mechanical crimp connection with a butt sleeve, an oxide-preventing aerosol lacquer, mastic electrical splicing tape, and standard electrical tape. At the completion of the installation, provide the Engineer with as-built drawings that document all splice locations.

Install WGUs in pull boxes and splice boxes as shown in the Plans or directed by the Engineer. Mount the device in a location high enough from the bottom of the box to allow access to terminal facilities without disturbing cables present within the box. Terminate the locate wires and connect the WGU to ground in accordance with the manufacturer's instructions.

Test the locate wire system after installation to ensure that it functions and can be used to accurately locate the conduit system.

630-3.10 Route Markers: Install route markers for fiber optic cable installations and ensure the following:

1. Markers are plumb and level and the notification information is clearly visible when viewed from the side facing the roadway.
2. Markers are set within the right of way.
3. Markers are placed at a 1 foot offset from the conduit system.
4. The top of the marker post is a minimum of 5 feet and maximum of 6 feet above the finish grade
5. Markers are spaced a maximum of 500 feet apart.

6. A clear line of sight is maintained from one marker to the next.

7. Markers are installed on both sides of the roadway at any crossing point where the conduit system changes to the opposite side of the roadway.

8. Markers are installed at the center point of any conduit run between two pull or splice boxes.9. Markers are installed at gate locations when the conduit system is adjacent to a fence line.

10. Markers are installed on both sides of a stream, river, or other water crossing,and on both sides of aboveground attachments such as bridges and walls.

Remove and replace all marker posts damaged during installation at no additional cost. Ensure that route marker signs are labeled with a unique identification number, as detailed in the Plans or as approved by the Engineer. Provide as-built documentation at the completion of installation that includes identification number and location of all installed route markers and correlates the marker to the fiber optic infrastructure that it signifies.

Ensure that installation of ERMs includes connection of the route marker to the locate wire associated with the conduit run that the markers identify. Install locate wire through the base of the marker and terminate the locate wires to connectors mounted on the terminal board inside the marker. Install an underground magnesium anode a minimum of 10 feet away from the marker and perpendicular to the conduit system. Terminate the anode lead on the connector mounted on the terminal board inside the marker. Install the bond straps between the anode connector and all locate wire connectors to provide cathodic protection for the locate wire conductor.

630-4 Method of Measurement.

630-4.1 General: Measurement for payment will be in accordance with the following work tasks.

630-4.2 Furnish and Install: The Contract unit price per foot of conduit, furnished and installed, will include furnishing all hardware and materials and all testing as specified in this Section and the Contract Documents, and all labor, casings, removal of excavated materials and spoils, removal and disposal of drilling fluids, locate wire, trenching, boring, backfilling, flowable fill and restoration materials necessary for a complete and accepted installation.

Payment for conduit placed underground will be based on the horizontal length of the trench or bore measured in a straight line between the centers of pull boxes, cabinets, poles, etc., in linear feet, regardless of the length or number of conduits installed. No allowance will be made for sweeps or vertical distances below the ground.

Payment for conduit placed aboveground or bridge mounted will be based on the actual length of conduit installed.

630-5 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section. Payment for conduit placed under existing turf will be made as open trench.

Payment for conduit placed under existing pavement (roadway, driveways, or sidewalk) will be made as directional bore. If conduit is being placed under both existing turf and existing pavement between two pull boxes, payment for the total pull box-to-pull box length will be made as directional

bore. Payment for conduit placed by jack & bore will be made as jack & bore, for the total pull box to pull box length.

No additional payment will be made for multiple conduits in the same trench.

No payment adjustment will be made if the Contractor chooses to use an alternative method approved by the Engineer.

No payment will be made for failed bore paths, injection of excavatable flowable fill, products taken out of service, or incomplete installations.

Payment will be made under:

Item No. 630- 2- Conduit – per foot.

STRUCTURES

SECTION 110 - CLEARING AND GRUBBING

110-1 Description.

Clear and grub within the areas of the roadway right-of-way and of borrow pits, sand- clay base material pits, lateral ditches, and any other areas shown in the Plans to be cleared and grubbed. Remove and dispose of all trees, stumps, roots and other such protruding objects, buildings, structures, appurtenances, existing flexible asphalt pavement, and other facilities necessary to prepare the area for the proposed construction. Remove and dispose of all product and debris not required to be salvaged or not required to complete the construction.

Also, perform certain miscellaneous work the Engineer considers necessary for the complete preparation of the overall project site, as follows:

1. Plug any water wells that are encountered within the right-of-way and that are to be abandoned.
2. Level the terrain outside the limits of construction for purposes of facilitating maintenance and other post-construction operations in accordance with 110-10.3.
3. Trim trees and shrubs within the project right-of-way that are identified in the Contract Documents.

Meet the requirements for such miscellaneous work as specified in 110-10.

110-2 Standard Clearing and Grubbing.

110-2.1 Work Included: Completely remove and dispose of all buildings, timber, brush, stumps, roots, rubbish, debris, and all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas, and all other structures and obstructions necessary to be removed and for which other items of the Contract do not specify the removal thereof, including septic tanks, building foundations, and pipes.

Perform Standard Clearing and Grubbing within the following areas:

1. All areas where excavation is to be done, including borrow pits, lateral ditches, right-of-way ditches, etc.
2. All areas where roadway embankments will be constructed.
3. All areas where structures will be constructed, including pipe culverts and other pipe lines.

110-2.2 Depths of Removal of Roots, Stumps, and Other Debris: In all areas where excavation is to be performed, or roadway embankments are to be constructed, remove roots and other debris

to a depth of 12 inches below the ground surface. Remove roots and other debris from all excavated material to be used in the construction of roadway embankment or roadway base. Plow the surface to a depth of at least 6 inches, and remove all roots thereby exposed to a depth of at least 12 inches. Completely remove and dispose of all stumps within the roadway right-of-way.

Remove all roots, etc., protruding through or appearing on the surface of the completed excavation within the roadway area and for structures, to a depth of at least 12 inches below the finished excavation surface.

Remove or cut off all stumps, roots, etc., below the surface of the completed excavation in borrow pits, material pits, and lateral ditches.

In borrow and material pits, do not perform any clearing or grubbing within 3 feet inside the right-of-way line.

Within all other areas where Standard Clearing and Grubbing is to be performed remove roots and other debris projecting through or appearing on the surface of the original ground to a depth of 12 inches below the surface, but do not plow or harrow these areas.

110-2.3 Trees to Remain: As an exception to the above provisions, where so directed by the Engineer, trim, protect, and leave standing desirable trees within the roadway area. Trim branches of trees extending over the area occupied by the roadway as directed, to give a clear height of 16 feet above the roadway.

110-2.4 Boulders: Remove any boulders encountered in the roadway excavation (other than as permitted under the provisions of 120-7.2) or found on the surface of the ground. When approved by the Engineer place boulders in neat piles inside the right of way. The Contractor may stockpile boulders encountered in City-furnished borrow areas, which are not suitable for use in the embankment construction, within the borrow area.

110-3 Selective Clearing and Grubbing.

The Contractor shall remove and dispose of all vegetation, obstructions, etc., as provided above except that, where so elected, the Contractor may cut roots, etc., flush with the ground surface. Completely remove and dispose of stumps. Entirely remove undergrowth except in specific areas designated by the Engineer to remain for aesthetic purposes. Trim, protect, and leave standing desirable trees, with the exception of such trees as the Engineer may designate to be removed in order to facilitate right-of-way maintenance. Remove undesirable or damaged trees as so designated by the Engineer. Perform Selective Clearing and Grubbing only in areas so designated in the Plans.

110-4 Protection of Property Remaining in Place.

Protect and do not displace property obstructions which are to remain in place, such as buildings, sewers, drains, water or gas pipes, conduits, poles, walls, posts, bridges, etc.

110-5 Removal of Buildings.

110-5.1 Parts to be Removed: Completely remove all parts of the buildings, including utilities, plumbing, foundations, floors, basements, steps, connecting concrete sidewalks or other pavement, septic tanks, and any other appurtenances, by any practical manner which is not detrimental to other property and improvements. Remove utilities to the point of connection to the utility authority's cut-in. After removing the sewer connections to the point of cut-in, construct a concrete plug at the cut-in point, as directed by the Engineer, except where the utility owners may elect to perform their own

plugging. Contact the appropriate utility companies prior to removal of any part of the building to ensure disconnection of services.

110-5.2 Removal by Others: Where buildings within the area to be cleared and grubbed are so specified to be removed by others, remove and dispose of any foundations, curtain walls, concrete floors, basements or other foundation parts which might be left in place after such removal of buildings by others.

110-6 Removal of Existing Structures.

110-6.1 Structures to be Removed: Remove and dispose of the materials from existing structures. Remove the following:

1. those structures, or portions of structures, shown in the Plans to be removed,
2. those structures, or portions of structures, found within the limits of the area to be cleared and grubbed, and directed by the Engineer to be removed,
3. those structures, or portion of structures, which are necessary to be removed in order to construct new structures, and
4. other appurtenances or obstructions which may be designated in the Contract Documents as to be included in an item of payment for the work under this Article.

Provide detailed schedule information to the Engineer 15 working days prior to the commencement of any demolition or renovation of any structures, even if asbestos is not found on the project, for the Engineer's use in notifying the City of Environmental Protection (DEP) on DEP Form 62-257.900(1) "Notice of Asbestos Renovation or Demolition".

110-6.2 Method of Removal:

110-6.2.1 General: Remove the structures in such a way so as to leave no obstructions to any proposed new structures or to any waterways. Pull, cut off, or break off pilings to the requirements of the permit or other Contract Documents, or if not specified, not less than 2 feet below the finish ground line. In the event that the Plans indicate channel excavation to be done by others, consider the finish ground line as the limits of such excavation. For materials which are to remain the property of the City or are to be salvaged for use in temporary structures, avoid damage to such materials, and entirely remove all bolts, nails, etc. from timbers to be so salvaged. Mark structural steel members for identification as directed.

110-6.2.2 Removal of Steel Members With Hazardous Coatings: Provide to the Engineer for approval, a copy of the "Contractor's Lead in Construction Compliance Program" from the firm actually removing and disposing of these steel members before any members are disturbed.

Vacuum power tool clean any coated steel member to bare metal as defined by SSPC-SP11 a minimum of 4 inches either side of any area to be heated (torch cutting, sawing, grinding, etc.) in accordance with 29 CFR 1926.354. Abrasive blasting is prohibited.

Provide air supplied respirators in accordance with 29 CFR 1926.62 and 29 CFR 1910.134.

110-6.3 Partial Removal of Bridges: On concrete bridges to be partially removed and widened, remove concrete by manually or mechanically operated pavement breakers, by concrete saws, by chipping hammers, or by hydro-demolition methods. Do not use explosives. Where concrete is to be removed to neat lines, use concrete saws or hydro-demolition methods capable of providing a reasonably uniform cleavage face. If the equipment used will not provide a uniform cut without

surface spalling, first score the outlines of the work with small trenches or grooves. For all demolition methods, submit for review and approval of the Engineer, a demolition plan that describes the method of removal, equipment to be used, types of rebar splices or couplers, and method of straightening or cutting rebars. In addition, for hydro- demolition, describe the method for control of water or slurry runoff and measures for safe containment of concrete fragments that are thrown out by the hydro-demolition machine.

110-6.4 Authority of U.S. Coast Guard: For structures in navigable waters, when constructing the project under authority of a U.S. Coast Guard permit, the U.S. Coast Guard may inspect and approve the work to remove any existing structures involved therein, prior to acceptance by the City.

110-6.5 Asbestos Containing Materials (ACM) Not Identified Prior to the Work: When encountering or exposing any condition indicating the presence of asbestos, cease operations immediately in the vicinity and notify the Engineer.

Make every effort to minimize the disturbance of the ACM. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Provisions shall meet all applicable laws, rules or regulations covering hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

The Engineer will notify the City who will coordinate selecting and tasking the City's Asbestos Contractor or Contamination Assessment/Remediation Contractor (CAR). Provide access to the potential contamination area. Preliminary investigation by the Asbestos/CAR Contractor will determine the course of action necessary for site security and the steps necessary to resolve the contamination issue.

The Asbestos/CAR Contractor will delineate the contamination areas, any staging or holding area required. Coordinate with the Asbestos/CAR Contractor and the Engineer to develop a work plan that will provide the Asbestos/CAR Contractor's operations schedule with projected completion dates for the final resolution of the contamination issue.

The Asbestos/CAR Contractor will maintain jurisdiction over activities inside any outlined contaminated areas and any associated staging holding areas. The Asbestos/CAR Contractor will be responsible for the health and safety of workers within the delineated areas. Provide continuous access to these areas for the Asbestos/CAR Contractor and representatives of regulatory or enforcement agencies having jurisdiction.

Both Contractors will use the schedule as a basis for planning the completion of both work efforts. The Engineer may grant the Contract Time extensions according to the provisions of 8-7.3.2.

Cooperate with the Asbestos/CAR Contractor to expedite integration of the Asbestos/CAR Contractor's operations into the construction project. The Prime Contractor is not expected to engage in routine construction activities involving asbestos containing materials. Adjustments to quantities or to Contract unit prices will be made according to work additions or reductions on the part of the Prime Contractor in accordance with 4-3.

The Engineer will direct the Prime Contractor when operations may resume in the affected area.

110-7 Removal of Existing Pavement.

Remove and dispose of existing rigid portland cement concrete pavement, sidewalk, slope pavement, ditch pavement, curb, and curb and gutter etc., where shown in the Plans or ordered by the Engineer to be removed or where required because of the construction operations. Retaining walls, drainage structures and flexible asphalt pavement are not included in the work under this Article.

110-8 Ownership of Materials.

Except as may be otherwise specified in the Contract Documents, the Contractor shall take ownership of all buildings, structures, appurtenances, and other materials removed by him and shall dispose of them in accordance with 110-9.

110-9 Disposal of Materials.

110-9.1 General: Either stack materials designated to remain the property of the City in neat piles within the right-of-way or load onto the City's vehicles.

Dispose of timber, stumps, brush, roots, rubbish, and other objectionable material resulting from clearing and grubbing in areas and by methods meeting the applicable requirements of all Local, State and Federal regulations. Do not block waterways by the disposal of debris.

110-9.2 Burning Debris: Where burning of such materials is permitted, perform all such burning in accordance with the applicable laws, ordinances, and regulations. Perform all burning at locations where trees and shrubs adjacent to the cleared area will not be harmed.

110-9.3 Timber and Crops: The Contractor may sell any merchantable timber, fruit trees, and crops that are cleared under the operations of clearing and grubbing for his own benefit, subject to the provisions of 7-1.2, which may require that the timber, fruit trees, or crops be burned at or near the site of their removal, as directed by the Engineer. The Contractor is liable for any claims which may arise pursuant to the provisions of this Subarticle.

110-9.4 Disposal of Treated Wood: Treated wood, including that which comes from bridge channel fender systems, must be handled and disposed of properly during removal. Treated wood should not be cut or otherwise mechanically altered in a manner that would generate dust or particles without proper respiratory and dermal protection. The treated wood must be disposed of in at least a lined solid waste facility or through recycling/reuse. Treated wood shall not be disposed by burning or placement in a construction and demolition (C&D) debris landfill. All compensation for the cost of removal and disposal of treated wood will be included in the Cost of Removal of Existing Structures.

110-9.5 Hazardous Materials/Waste: Handle, transport and dispose of hazardous materials in accordance with all Local, State and Federal requirements including the following:

1. SSPC Guide 7
2. Federal Water Pollution Control Act, and
3. Resource Conservation and Recover Act (RCRA).

Accept responsibility for the collection, sampling, classification, packaging, labeling, accumulation time, storage, manifesting, transportation, treatment and disposal of hazardous waste, both solid and liquid. Separate all solid and liquid waste and collect all liquids used at hygiene stations and handle as hazardous materials/waste. Obtain written approval from the Engineer for all hazardous materials/waste stabilization methods before implementation.

Obtain an EPA/FDEP Hazardous Waste Identification Number

(EPA/FDEP ID Number) before transporting and/or disposal of any hazardous materials/waste.

List the City as the generator of all hazardous materials/waste.

Submit the following for the Engineers' approval before transporting, treatment or disposal of any hazardous materials/waste:

1. Name, address and qualifications of the transporter,
2. Name, address and qualifications of the treatment facility,
3. Proposed treatment and/or disposal of all Hazardous Materials/Waste. Transport all hazardous materials/waste in accordance with applicable 40 CFR 263 Standards. Provide a copy of all completed Hazardous Materials/Waste manifest/bills of lading to the Engineer within 21 days of each shipment.

110-9.5.1 Steel Members With Hazardous Coating: Dispose of steel members with hazardous coating in one of the following manners:

1. Deliver the steel members and other hazardous waste to a licensed recycling or treatment facility capable of processing steel members with hazardous coating.
2. Deliver the steel members with hazardous coating to a site designated by the Engineer for use as an offshore artificial reef. Deliver any other hazardous materials/waste to a licensed hazardous materials/waste recycling treatment facility.

Dismantle and/or cut steel members to meet the required dimensions of the recycling facility, treatment facility or offshore artificial reef agency.

All compensation for the cost of removal and disposal of hazardous materials/waste will be included in the Cost of Removal of Existing Structures.

110-9.5.2 Certification of Compliance: Furnish two copies of Certification of Compliance from the firm actually removing and disposing of the hazardous materials/waste stipulating, the hazardous materials/waste has been handled, transported and disposed of in accordance with this Specification. The Certification of Compliance shall be attested to by a person having legal authority to bind the company.

Maintain all records required by this Specification and ensure these records are available to the City upon request.

110-10 Miscellaneous Operations.

110-10.1 Water Wells Required to be Plugged: Fill or plug all water wells within the right-of-way, including areas of borrow pits and lateral ditches, that are not to remain in service, in accordance with applicable Water Management District rules or the City of Environmental Protection regulations.

Cut off the casing of cased wells at least 12 inches below the ground line or 12 inches below the elevation of the finished excavation surface, whichever is lower. Water wells, as referred to herein, are defined either as artesian or non-artesian, as follows:

1. An artesian well is an artificial hole in the ground from which water supplies may be obtained and which penetrates any water-bearing rock, the water in which is raised to the surface by natural flow or which rises to an elevation above the top of the water- bearing bed. Artesian wells are further defined to include all holes drilled as a source of water that penetrate any water-bearing beds that are a part of the artesian water system of Florida, as determined by representatives of the applicable Water Management District.

2. A non-artesian (water-table) well is a well in which the source of water is an unconfined aquifer. The water in a non-artesian well does not rise above the source bed.

When the Plans do not indicate whether a non-flowing well is artesian or non- artesian, obtain this information from the Engineer.

110-10.2 Landscape Areas: When certain areas of the right-of-way, outside of the limits of construction, are shown in the Plans or designated by the Engineer to be landscaped, either under the construction Contract or at a later time, remove undesirable trees, stumps, undergrowth, and vegetation, as directed, and preserve and trim natural growth and trees as directed by the Engineer.

110-10.3 Leveling Terrain: Within the areas between the limits of construction and the outer limits of clearing and grubbing, fill all holes and other depressions, and cut down all mounds and ridges. Make the area of a sufficient uniform contour so that the City's subsequent mowing and cutting operations are not hindered by irregularity of terrain. Perform this work regardless of whether the irregularities were the result of construction operations or existed originally.

110-10.4 Mailboxes: When the Contract Documents require furnishing and installing mailboxes, permit each owner to remove the existing mailbox. Work with the Local Postmaster to develop a method of temporary mail service for the period between removal and installation of the new mailboxes. Install the mailboxes in accordance with the Design Standards.

110-11 Method of Measurement.

110-11.1 Clearing and Grubbing: When direct payment is provided in the Contract, the quantity to be paid for will be the lump sum quantity.

110-11.2 Removal of Existing Structures: When direct payment is provided in the Contract, the quantity to be paid for will be the lump sum quantity or quantities for the specific structures removed, as designated.

110-11.3 Removal of Existing Pavement: Payment for removal of flexible asphalt pavement is included in the Lump Sum price for Clearing and Grubbing.

No separate payment will be made for removal of curb, sidewalk, slope pavement, or ditch pavement that is removed and replaced, as specified in 520-11, 522-9, and 524-10.

The quantity to be paid for will be the number of square yards of existing pavement of the types listed in 110-7, acceptably removed and disposed of, as specified. The quantity will be determined by actual measurement along the surface of the pavement before its removal. Measurements for appurtenances which have irregular surface configurations, such as curb and gutter, steps, and ditch pavement, will be the area as projected to an approximate horizontal plane. Where the removal of pavement areas is necessary only for the construction of box culverts, pipe culverts, storm sewers, inlets, manholes, etc., these areas will not be included in the measurements.

110-11.4 Plugging Water Wells: When direct payment is provided in the Contract, the quantity to be paid for will be the number of water wells plugged, for each type of well (artesian or non-artesian).

110-11.5 Mailboxes: When direct payment is provided in the Contract, the quantity to be paid for will be the number of mailboxes acceptably furnished and installed.

110-11.6 Delivery of Salvageable Material to the City When direct payment is provided in the Contract, the quantity to be paid for will be the Lump Sum quantity for delivery of salvageable materials to the City as indicated in the Plans.

110-11.7 General: In each case, except as provided below, where no item of separate payment for such work is included in the proposal, all costs of such work will be included in the various scheduled items in the Contract, or under specific items as specified herein below or elsewhere in the Contract.

110-12 Basis of Payment.

110-12.1 Clearing and Grubbing:

110-12.1.1 Lump Sum Payment: Price and payment will be full compensation for all clearing and grubbing required for the roadway right-of-way and for lateral ditches, channel changes, or other outfall areas, and any other clearing and grubbing indicated, or required for the construction of the entire project, including all necessary hauling, furnishing equipment, equipment operation, furnishing any areas required for disposal of debris, leveling of terrain and the landscaping work of trimming, etc., as specified herein, except for any areas designated to be paid for separately or to be specifically included in the costs of other work under the Contract.

Where construction easements are specified in the Plans and the limits of clearing and grubbing for such easements are dependent upon the final construction requirements, no adjustment will be made in the lump sum price and payment, either over or under, for variations from the limits of the easement defined in the Plans.

110-12.1.2 When No Direct Payment is Provided: When no item for clearing and grubbing is included in the proposal, the Contractor shall include the cost of any work of clearing and grubbing which is necessary for the proper construction of the project in the Contract price for the structure or other item of work for which such clearing and grubbing is required.

The Contractor shall include the cost of all clearing and grubbing which might be necessary in pits or areas from which base material is obtained in the Contract price for the base in which such material is used. The clearing and grubbing of areas for obtaining stabilizing materials, where required only for the purpose of obtaining materials for stabilizing, will not be paid for separately.

110-12.2 Removal of Existing Structures: Price and payment will be full compensation for all work of removal and disposal of the designated structures.

When direct payment for the removal of existing structures is not provided in the proposal, the Contractor shall include the cost of removing all structures in the Contract price for clearing and grubbing or, if no item of clearing and grubbing is included, in the compensation for the other items covering the new structure being constructed.

110-12.3 Removal of Existing Pavement: Price and payment will be full compensation for performing and completing all the work of removal and satisfactory disposal.

When no separate item for this work is provided and no applicable item of excavation or embankment covering such work (as provided in 120-13.1) is included, the Contractor shall include the costs of this work in the Contract price for the item of clearing and grubbing or for the pipe or other structure for which the pavement removal is required.

110-12.4 Plugging Water Wells: Price and payment will be full compensation for each type of well acceptably plugged.

If a water well requiring plugging is encountered and the Contract contains no price for plugging wells of that specific type, the plugging of such well will be paid for as unforeseeable work.

110-12.5 Mailboxes: Price and payment will be full compensation for all work and materials required, including supports and numbers.

110-12.6 Delivery of Salvageable Material to the City: Price and payment will be full compensation for all work required for delivery of the materials to the City.

110-12.7 Payment Items:

Payment will be made under:

Item No. 110- 1-	Clearing and Grubbing - lump sum.
Item No. 110- 3-	Removal of Existing Structures - lump sum.
Item No. 110- 4-	Removal of Existing Pavement - per square yard.
Item No. 110- 5-	Plugging Water Wells (Artesian) - each.
Item No. 110- 6-	Plugging Water Wells (Non-Artesian) - each.
Item No. 110- 7-	Mailbox (Furnish and Install) - each.
Item No. 110- 86-	Delivery of Salvageable Material to FDOT - lump sum.

SECTION 400 - CONCRETE STRUCTURES

400-1 Description.

Construct concrete structures and other concrete members, with the exception of pavement and incidental concrete construction (which are specified in other Sections).

Refer to Section 450 for prestressed construction requirements additional to the requirements of this Section.

For precast concrete structures meet the requirements of Section 450 for inserts and lifting devices, handling, storage, shipping, and erection.

Obtain incidental precast products from a plant that is currently on the City's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

400-2 Materials.

Meet the following requirements:

Concrete ..... Sections 346 and 347
Penetrant Sealer ..... Section 413
High Molecular Weight Methacrylate (HMWM)**
..... Section 413
Reinforcing for Concrete ..... Section 415
Water ..... Section 923
Curing Materials* ..... Section 925
Epoxy Bonding Compounds** ..... Sections 926 and 937
Joint Materials** ..... Section 932
Bearing Pads ..... Section 932
Non-Shrink Grout** ..... Section 934
Class 5 Applied Finish Coatings** ..... Section 975
Galvanizing Compound** ..... Section 562
Dowel Bar Assembly** ..... Section 931
Filter Fabric ..... Section 985

*The Engineer will allow clean sand and sawdust for certain curing, when and as specified.
**Use products listed on the City's Approved Product List (APL).

400-3 Depth of Footing.

Refer to Section 455, "D. SPREAD FOOTINGS".

400-4 Falsework.

400-4.1 Plans: At the Engineer's request, submit detailed plans for falsework or centering to the City. The Contractor is responsible for results obtained by using these plans.

400-4.2 Design and Erection: Design and construct all falsework to provide the necessary rigidity and to support the loads without appreciable settlement or deformation. Use screw jacks or hardwood wedges to take up any settlement in the framework, either before or during the placing of concrete. If any weakness develops and the centering shows undue settlement or distortion, stop the work, remove any masonry affected, and strengthen the falsework before resuming work. Support falsework which cannot be founded on a satisfactory footing on piling. Space, drive, and remove the piling in an approved manner.

400-4.3 Camber: Provide camber to correct for settlement and deflection of falsework. Give bridges permanent camber only when shown in the Plans.

400-4.4 Bridge Deck Overhang Falsework for Steel I-Girders: Locate the lower contact point of bridge deck overhang falsework supporting screed rails within 6 inches above the bottom flange. If the lower contact point of the overhang falsework bears more than 6 inches above the bottom flange and/or if the deck overhang is 4 feet or greater, submit shop drawings and calculations to the Engineer in accordance with Section 5 and Chapter 11 of the Structures Design Guidelines (SDG). The deck overhang is measured from the centerline of the girder supporting the overhang falsework to the outside edge of the concrete deck.

400-5 Forms.

400-5.1 General: Provide forms, either of wood or metal, that are as follows: externally secured and braced where feasible; substantial and unyielding; of adequate strength to contain the concrete without bulging between supports and without apparent deviation from the neat lines, contours, and shapes shown in the Plans. Design forms to withstand the additional forces of vibration without apparent deviation from the desired shape or position. Assemble forms to be mortar-tight. If using lumber forms, construct them of dressed wood of uniform thickness. Use form liners on wooden forms where Class 3 surface finish is specified. Construct assembled forms to render a concrete surface of smooth, uniform finish. Make provisions to remove forms without injury to concrete surfaces. Remove blocks and bracing with the forms, and do not leave any portion of the forms in the concrete. Use the same form system for a type of work throughout.

400-5.2 Inspection and Approval: Do not place concrete in a form until the form has been inspected and approved. Although the Engineer inspects and approves the forms, the Contractor is responsible for obtaining satisfactory concrete surfaces, free from warping, bulging, or other objectionable defects. Pay special attention to the ties and bracing. Where the forms appear to be insufficiently braced or unsatisfactorily built, stop and correct defects to the satisfaction of the Engineer.

400-5.3 Non-metallic Form Materials:

400-5.3.1 Lumber: For all surfaces, use lumber that is not less than 3/4 inch in thickness, dressed, and free of knot holes, loose knots, cracks, splits, warps, and other defects. Proportion the spacing of studs, joists, and wales to exclude warps and bulges and to produce true and accurate concrete surfaces. Only use structurally sound lumber.

400-5.3.2 Form Liners: Use form liners of durable, abrasion resistant materials that are unaffected by water. Use liners with a hard surface texture capable of rendering concrete surfaces of a smooth, uniform texture, without grain marks, patterns, or blemishes. Use form liner material of sufficient thickness to eliminate the reflection of irregularities, undesirable patterns, and marks from the forms to the surfaces. Replace liners as necessary to produce a consistent concrete surface texture. Use form liners in large sheets and with true, tight-fitted joints which are logically located. Obtain the Engineer's approval of the layout of sheets. Do not use liners which have been patched. Use liner material of the same stock throughout.

400-5.3.3 Plywood: The Contractor may use plywood of not less than 5/8 inch in thickness manufactured with waterproof glue or protected with an approved impervious coating. Do not use pieces with bulged plies or raveled, untrue edges.

400-5.4 Special Requirements:

400-5.4.1 Re-entrant Angles: Use chamfered forms for exterior concrete corners and filleted forms for interior concrete corners. Use chamfers and fillets that are 3/4 by 3/4 inch and are mill-dressed on all sides to uniform dimensions. The Contractor may use plastic or metal chamfers and fillets provided they perform satisfactorily in producing uniform, smooth concrete corner surfaces without honeycomb.

400-5.4.2 Handrails and Parapets: Construct barriers and parapets in accordance with Section 521.

400-5.4.3 End-bent Caps: Do not place forms for end-bent caps until the embankment has been constructed to within 12 inches of the bottom of the cap. Place a mass of embankment that is sufficient to produce the subsidence, displacement, and settlement which may result from the construction of the total embankment.

400-5.4.4 Footings: Where footing concrete can be placed in dry excavation, the Contractor may omit cribs, cofferdams, and forms, subject to compliance with the following limitations and conditions:

1. Use this procedure only in locations not exposed to view from traveled roadways.
2. Obtain required elevations shown in the Plans.
3. Obtain neat line dimensions shown in the Plans.
4. Fill the entire excavation with concrete to the required elevation of the top of the footing.
5. The Engineer will determine the volume of footing concrete to be paid for from the neat line dimensions shown in the Plans.

400-5.5 Form Alignment, Bracing, and Ties: Construct forms in such manner that they may be adequately secured for alignment, shape, and grade. Use bracing systems, ties, and anchorages that are substantial and sufficient to ensure against apparent deviation from shape, alignment, and grade. Do not drive nails into existing concrete. Do not use bracing systems, ties, and

anchorages which unnecessarily deface or mark, or have an injurious or undesirable effect on surfaces that will be a part of the finished surface.

If metal ties and anchorages are to remain in the concrete, construct them so as to permit the removal of metal to at least 1 inch beneath the finished surface of concrete. Use accessories for metal ties and anchorages that allow the removal of metal to the prescribed depth while leaving the smallest possible repairable cavity.

When using wire ties, cut or bend them back from the finished surface of the concrete a minimum of 1 inch. Do not use internal ties of wire when forming surfaces that are exposed to view.

400-5.6 Preparation and Cleaning: Meet the following requirements for the condition of forms at the time of beginning concrete casting:

1. Treat all forms with an approved form-release agent before placing concrete. Do not use material which adheres to or discolors the concrete.

2. Clean forms of all concrete laitance from previous use and all dirt, sawdust, shavings, loose wire ties and other debris.

3. Close and secure all inspection and cleanout holes.

400-5.7 Stay-In-Place Metal Forms:

400-5.7.1 General: Utilization of stay-in-place metal forms is permitted in lieu of removable forms to form concrete bridge decks between beams and between the webs of individual box girders when designated in the Plans. Stay-in-place metal forms may be of the cellular, non-cellular or non-cellular with top cover sheet type. The flutes of non-cellular stay-in-place metal forms may be filled with polystyrene foam or concrete. When polystyrene foam is used to fill the forms, fill form flutes completely; do not allow any portion of the polystyrene foam to extend beyond the limits of the flutes. Ensure that the polystyrene foam remains in its required position within flutes during the entire concrete placement process. Do not use reinforcing supports or other accessories in such a manner as to cause damage to the polystyrene foam. Replace all damaged polystyrene foam to the satisfaction of the Engineer.

Apply polymer sheeting to stay-in-place metal forms in accordance with the requirements in the following table. Apply polymer sheeting to all faces and edges (including sheared edges) of support angles used on bridges with Moderately and Extremely Aggressive Superstructure Environmental Classifications (as shown in the Plans). No polymer sheeting is required for beam attachment straps or clips partially embedded in concrete, and for support angles used on bridges with a Slightly Aggressive Superstructure Environmental Classification. Use polymer sheeting materials and application methods as described herein.

Polymer Sheeting Usage Requirements			
Form Type	Superstructure Environmental Classification (as shown in Plans)		
	Slightly Aggressive	Moderately	Extremely Aggressive
Non-cellular form with concrete filled flutes	No polymer sheeting required	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side

Non-cellular form with polystyrene foam filled flutes		Polymer sheeting required on inside	Polymer sheeting required on both sides*	Polymer sheeting required on both sides*
Non-cellular form with Top Cover Sheet	Top Cover Sheet	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side
	Non-cellular form	Polymer sheeting required on top side	Polymer sheeting required on both sides*	Polymer sheeting required on both sides*
Cellular form		No polymer sheeting allowed or required	Not permitted	Not permitted
* Polymer sheeting not required on bottom side of form located within box girders and U-beams.				

Prior to using stay-in-place metal forms, submit detailed plans for approval of the forming system, including method of support and attachment and method of protecting the supporting structural steel components from welding effects. Submit design calculations for the forming system, which have been signed and sealed by the Specialty Engineer. Detail stay-in-place metal forms such that they in no way infringe upon the concrete outline of the slab shown on the Plans. Use stay-in-place metal forms that provide and maintain the dimensions and configuration of the original slab in regards to thickness and slope.

Do not weld stay-in-place metal form supports and connections to the structural steel components. Do not connect polymer coated angles or other hardware that support polymer coated metal forms to the beam attachment straps or clips by welding. Electrical grounding to steel reinforcing or fiber reinforced polymer (FRP) reinforcing is prohibited.

Protect structural steel components from damage by using a shield to guard against weld splatter, weld overrun, arc strikes, or other damaging effects of the welding process. Upon completion of welding, rest the metal form support flush on the supporting steel component. Should any weld spatter, weld overrun, arc strike, or other effects of the welding process be evident or occur to the structural steel component, immediately stop in-place welding of the metal form supports for the remainder of the work. In this event, weld all metal form supports off of the structure and erect the forms after prefabrication, or use an alternate approved method of attaching the form supports. Remove improper weldment, repair the supporting steel component for any improper welding. Perform all required verification and testing at no expense to the City and to the satisfaction of the Engineer.

Do not use stay-in-place metal forms until the forming system has been approved by the Engineer. The Contractor is responsible for the performance of the stay-in-place forms.

Structures designed, detailed, and dimensioned for the use of removable forms: Where stay-in-place metal forms are permitted, the Contractor is responsible and shall obtain the approval of the Engineer for any changes in design, etc. to accommodate the use of stay-in-place forms. The Engineer will compute pay quantities of the various components of the

structure which are paid on a cubic yard basis from the design dimensions shown in the Plans with no allowance for changes in deflection or dimensions necessary to accommodate the stay- in-place forms or concrete to fill the form flutes. The Engineer will limit pay quantities of other Contract items that the Contractor increases to accommodate the use of stay-in-place forms to the quantity required for the original plan design.

Submit all changes in design details of bridge structural members that support stay-in-place forms, showing all revisions necessary to enable the supporting components to withstand any additional weight of the forms and the weight of any extra concrete that may be required to fill the forms. Include with the design calculations a comparative analysis of the stresses in the supporting components as detailed on the Contract Plans and as modified to support the forms. Use the identical method of analysis in each case, and do not allow the stresses in the modified components to exceed those of the component as detailed in the Contract Plans. Include with the design the adjusted cambers for any changes in deflection over those shown on the original Plans. Modify the beams to provide additional strength to compensate for the added dead loads imposed by the use of stay-in-place forms. Obtain the additional strength by adding strands to the pre-stressed beams or by adding steel material to increase the section modulus of steel girders. Substantiate the added strength by the comparative calculations. Do not use stay-in-place forms until the forming system and all necessary design revisions of supporting members have been approved by the Engineer.

Structures designed, detailed, and dimensioned for the use of stay-in-place metal forms:

Prior to using stay-in-place metal forms, submit detailed plans for approval of the forming system (including method of support and attachment) together with design calculations. Include an analysis of the actual unit weight of the proposed forming system over the projected plan area of the metal forms. If the weight thus calculated exceeds the weight allowance for stay-in-place metal forms and concrete required to fill the forms shown on the Plans, then modify the supporting components to support the excess weight as specified by the Contractor's Specialty Engineer.

For all structures utilizing structural steel supporting components, paint the vertical sides of the top flange prior to installation of the stay-in-place metal forms in accordance with Section 560.

For non-polymer sheeting form surfaces, use zinc paint coating in accordance with Section 562 to all accessories cut from galvanized sheets, which are not embedded in concrete.

400-5.7.2 Design: Meet the following criteria for the design of stay-in-place bridge deck forms:

1. The maximum self weight of the stay in place metal forms, plus the weight of the concrete or expanded polystyrene required to fill the form flutes (where used), shall not exceed 20 psf.

2. Design the forms on the basis of dead load of form, reinforcement, and plastic concrete plus 50 pounds per square foot for construction loads. Use a unit working stress in the steel sheet of not more than 0.725 of the specified minimum yield strength of the material furnished, but not to exceed 36,000 psi.

3. Do not allow deflection under the weight of the forms, reinforcement, and plastic concrete to exceed 1/180 of the form span or 1/2 inch, whichever is less, for form spans of 10 feet or less, or 1/240 of the form span or 3/4 inch, whichever is less, for form spans greater than 10 feet. In all cases, do not use a total loading (psf) that is less than 20 plus the product of the deck thickness measured in inches times 12.5.

4. Use a design span of the form equal to the clear span of the form plus 2 inches. Measure the span parallel to the form flutes.

5. Compute physical design properties in accordance with requirements of the AISI Specifications for the Design of Cold Formed Steel Structural Members, latest published edition.

6. For all reinforcement, maintain the design concrete cover required by the Plans.

7. Maintain the plan dimensions of both layers of primary deck reinforcement from the top surface of the concrete deck.

8. Do not consider the permanent bridge deck form as lateral bracing for compression flanges of supporting structural members.

9. Do not use permanent steel bridge deck forms in panels where longitudinal deck construction joints are located between stringers.

10. Secure forms to the supporting members by means other than welding directly to the member.

400-5.7.3 Materials:

400-5.7.3.1 Metal Forms: Fabricate stay-in-place metal forms and supports from steel meeting the requirements of ASTM A653 having a coating designation G165. Do not use form materials that are less than 0.03 inch uncoated thickness.

400-5.7.3.2 Polymer Sheeting: Use polymer sheeting comprised of at least 85% ethylene acrylic acid copolymer capable of being applied to both G165 and G210 steel sheet as described in ASTM A742. Ensure that the polymer sheeting has a nominal thickness of 12 mils as manufactured and a minimum thickness of 10 mils after lamination to the steel sheet. Ensure that the polymer sheeting remains free of holes, tears and discontinuities and sufficiently flexible to withstand the forming process without any detrimental effects to bond, durability or performance. Ensure that the polymer sheeting is UV stabilized and contains antioxidants.

Ensure that the as-manufactured polymer sheeting (prior to application) has an Oxidative Induction Time (OIT) of 60 to 75 minutes at 170°C in air when tested according to ASTM D3895. Perform additional OIT tests on samples taken from the finished product (polymer sheeting applied to forms) resulting in a minimum OIT according to ASTM D3895 of 32 minutes at 170°C in air. Ensure that the polymer sheeting adheres to galvanized metal sufficient to prevent undercutting at penetrations made through the polymer sheeting or metal forms to the satisfaction of the Engineer. Ensure that edges subjected to shear cutting are coated by the form manufacturer with two coats of a compatible liquid coating repair material before delivery to the site. Ensure that steel used to produce polymer laminated metal forms is

appropriately cleaned and prepared per NCCA (National Coil Coating Association) standard continuous coil coating practices. Ensure that pretreatment for use in conjunction with the manufacturer's polymer sheeting material is approved as compatible by the polymer sheeting manufacturer. Apply pretreatment in accordance with the polymer sheeting manufacturer's procedures. Apply polymer sheeting in accordance with the manufacturer's recommendations and procedures. Ensure that all steel has the polymer sheeting applied prior to fabrication of the stay-in-place forms and accessories.

Ensure that the screws to be used in the fastening of the stay-in-place laminated metal forms have a corrosion resistant cladding that will not have an adverse effect to the system due to the contact of dissimilar metals.

400-5.7.3.3 Certification: Submit a written certification from the manufacturer stating the product meets the requirements of this specification along with the delivery of the coated forms to the jobsite. Ensure that the certification conform**s** to the requirements of Section 6. Ensure that the manufacturer has a quality control program conforming to ISO 9001 2000 standards.

400-5.7.3.4 Polystyrene Foam: Use polystyrene foam comprised of expanded polystyrene manufactured from virgin resin of sufficient density to support the weight of concrete without deformation. Extrude the polystyrene foam to match the geometry of the flutes and provide a snug fit. Use polystyrene foam that has a density of not less than 0.8 pounds per cubic foot. Use polystyrene foam that has water absorption of less than 2.6% when tested according to ASTM C272. Submit a written certification from the manufacturer stating the product meets the requirements of this Specification along with the delivery of the product.

400-5.7.4 Construction: Install all forms in accordance with approved fabrication and erection plans.

Do not rest form sheets directly on the top of the stringer of floor beam flanges. Fasten sheets securely to form supports, and maintain a minimum bearing length of 1 inch at each end for metal forms. Place form supports in direct contact with the flange of the stringer or floor beam. Make all attachments for coated metal forms by bolts, clips, screws, or other approved means.

400-5.7.4.1 Form Galvanizing Repairs: For any permanent exposed steel where the galvanized coating has been damaged, thoroughly clean, wire brush, and paint it with two coats of galvanizing compound in accordance with Section 562 to the satisfaction of the Engineer. Do not touch up minor heat discoloration in areas of welds.

400-5.7.4.2 Polymer Sheeting Repairs: Inspect and identify areas for damage to the polymer sheeting and repair with liquid polymer coating similar and compatible with respect to durability, adhesion and appearance in accordance with ASTM A762, as furnished by the stay-in-place form manufacturer. Ensure that the inspection includes checking the polymer sheeting for cuts, tears, cracking, surface pits, peeling, dirt, grease, oil, stains, rust or bare areas. Reject any panels that show coating blistering, peeling or cracking. Repair all polymer sheeting damage according to the following:

1. Surface Preparation: Ensure that all surfaces to be repaired are clean and free of any deleterious substances. Remove all traces of dirt, soil, oil deposits, greases,

and other surface contaminates in accordance with the polymer sheeting and coating manufacturer's written specifications prior to touch-up and recoating.

2. Application Procedures: Ensure that the liquid polymer repair coating is applied to a clean dry surface and in accordance with the manufacturer's written specifications. Apply the repair coating using a suitable paintbrush or other means acceptable to the Engineer. Apply a first coat of product to the surface at 2-4 mils in thickness. Let the first coat air dry. Apply a second coat to form a complete layer and increase the thickness, immediately after verifying the first coat is dry to the touch (15 - 25 minutes depending on the local air drying temperature and atmospheric conditions). Apply the second coat at the same coating thickness as the first at 2-4 mils. Ensure that the total dry film thickness of the two coats is not less than 6 mils. Apply additional coats in this same manner until desired coating thickness is achieved.

400-5.7.5 Placing of Concrete: Vibrate concrete to avoid honeycomb and voids, especially at construction joints, expansion joints, valleys and ends of form sheets. Use approved pouring sequences. Do not use calcium chloride or any other admixture containing chloride salts in the concrete.

400-5.7.6 Inspection: The Engineer will observe the Contractor's method of construction during all phases of the construction of the bridge deck slab, including the installation of the metal form system; location and fastening of the reinforcement; composition of concrete items; mixing procedures, concrete placement, and vibration; and finishing of the bridge deck. Should the Engineer determine that the procedures used during the placement of the concrete warrant inspection of the underside of the deck, remove at least one section of the metal forms in each span for this purpose. Do this as soon after placing the concrete as practicable in order to provide visual evidence that the concrete mix and the procedures are obtaining the desired results. Remove an additional section in any span if the Engineer determines that there has been any change in the concrete mix or in the procedures warranting additional inspection.

If, in the Engineer's judgment, inspection is needed to check for defects in the bottom of the deck or to verify soundness, sound the metal forms with a hammer as directed by the Engineer after the deck concrete has been in place a minimum of two days. If sounding discloses areas of doubtful soundness to the Engineer, remove the metal forms from such areas for visual inspection after the concrete has attained adequate strength. Remove metal bridge deck forms at no expense to the City.

At locations where sections of the metal forms have been removed, the Engineer will not require the Contractor to replace the metal forms. Repair the adjacent metal forms and supports to present a neat appearance and to ensure their satisfactory retention and where they are polymer sheeted, coat all exposed surfaces of stay-in-place metal form system elements that are not coated or are damaged with a field applied liquid polymer coating as specified in 400-5.7.4.2. As soon as the form is removed, the Engineer will examine the concrete surfaces for cavities, honeycombing, and other defects. If irregularities are found, and the Engineer determines that these irregularities do not justify rejection of the work, repair the concrete as directed, and provide a General Surface Finish in accordance with 400-15. If the Engineer determines that the concrete where the form is removed is unsatisfactory, remove additional metal forms as necessary to inspect and repair the slab, and modify the method of construction as

required to obtain satisfactory concrete in the slab. Remove and replace all unsatisfactory concrete as directed, at no expense to the City.

If the method of construction and the results of the inspections as outlined above indicate that sound concrete has been obtained throughout the slabs, the amount of sounding and form removal may be reduced when approved by the Engineer.

Corrosion of assembly screws will not be considered a structural or aesthetic problem and is considered acceptable.

Provide the facilities for the safe and convenient conduct of the inspection procedures.

400-5.8 Stay-In-Place Concrete Forms:

400-5.8.1 General: Permanent stay-in-place precast reinforced concrete forms may be used in lieu of removable forms to form concrete bridge deck slabs subject to the conditions contained herein. Precast reinforced concrete stay-in-place forms are not permitted to construct a composite concrete deck. Do not use precast prestressed concrete stay-in-place forms to form any permanent bridge decks.

When detailed Plans for structures are dimensioned for the use of removable forms, provide additional slab thickness, elevation changes, changes in design, etc. to accommodate the use of stay-in-place forms, subject to the Engineer's approval. The Engineer will compute pay quantities of the various component members of the structure which are paid on a cubic yard basis from the design dimensions shown in the Plans with no allowance for changes in deflection and changes in dimensions necessary to accommodate the stay-in-place forms. The Engineer will limit pay quantities of other Contract items which are increased to accommodate the use of stay-in-place forms to the quantity required for the original plan design.

Prior to using stay-in-place forms, submit for approval detailed plans of the forming system and design calculations. Indicate on the plans the form panel sizes, placing patterns, type of mastic or felt bearing material and type and method of caulking between panels. Also, submit appropriate changes in design details of structural members supporting stay-in- place forms showing any revisions necessary to enable the supporting components to withstand the additional weight of the forms and perform equally as contemplated in the Plans. All calculations and details submitted shall be sealed by the Contractor's Engineer of Record. Modify the beams to provide additional strength to compensate for the added dead loads imposed by the use of stay-in-place forms. Obtain this strength by adding additional strands to prestressed girders or increasing the section modulus for steel girders. Do not use stay-in-place forms until the forming system and any necessary design revisions of supporting structural members have been approved by the Engineer. The City is not responsible for the performance of the stay-in-place forms by its approval.

400-5.8.2 Materials: Construct permanent concrete forms of precast reinforced concrete with a Class 3 Surface Finish. As a minimum, use the same class of concrete and28-day minimum compressive strength as being used to construct the bridge deck. Use welded steel wire reinforcement meeting the requirements of Section 931.

400-5.8.3 Design: Use the following criteria for the design of permanent bridge deck forms:

1. Design the forms on the basis of deadload of form, reinforcement, and plastic concrete plus an unfactored live load of 50 psf for construction loads. Meet the AASHTO design requirements for service loads and ultimate loads as applicable.

2. Deflection under the weight of the forms, reinforcement, and the plastic concrete shall not exceed 1/180 of the form span or 1/2 inch, whichever is less. In all cases, do not use a loading that is less than 120 psf total.

3. Use a design span of the form equal to the clear span of the form between supports. Measure the span of concrete forms parallel to the centerline of the form panels.

4. Compute physical design properties of concrete forms in accordance with current AASHTO design procedures.

5. Ensure that all reinforcement contained in the cast-in-place concrete has the minimum cover shown in the Plans or not less than one inch, whichever is greater. Measure the minimum cover normal to the plane of the bottom of the cast-in-place concrete. For stay-in-place concrete forms with other than plane surfaces in contact with the cast-in-place concrete, such as regularly spaced geometrical shapes projecting above the plane of the bottom of the cast-in-place concrete, meet the following special requirements:

a. Space geometrical shapes projecting above the bottom plane of the cast-in-place concrete used to provide support for reinforcement no closer than 3 feet apart and of sufficient height to maintain the required concrete cover on the bottom mat of reinforcing bars.

b. Construct all other geometrical shapes projecting above the plane of the bottom of the cast-in-place concrete to provide a minimum vertical clearance of 3/4 inch between the closest surface of the projections and the secondary longitudinal reinforcing bars in the deck slab.

c. Do not allow a minimum horizontal distance from the surface of any transverse reinforcing bars to surfaces of the stay-in-place form of less than 1 1/2 inches.

For all reinforcement for the stay-in-place form panels, provide a minimum of 1 inch concrete cover except that, for construction in a salt or other corrosive environment, provide a minimum of 1 1/2 inches concrete cover.

6. Maintain the plan dimensions of both layers of primary deck reinforcement from the top surface of the concrete deck. Measure the minimum cover of the bottom mat of reinforcement normal to the top of the precast concrete form panel.

7. Do not consider the permanent bridge deck form as lateral bracing for compression flanges of supporting structural members.

8. Do not use permanent concrete bridge deck forms in panels where longitudinal deck construction joints are located between stringers.

9. Do not allow the maximum weight of the concrete form to exceed 40 pounds per square foot of form surface.

400-5.8.4 Construction: Install all forms in accordance with approved fabrication and erection plans.

For concrete forms, provide a minimum bearing length of at least 1 1/2 inches but not exceeding 2 1/2 inches. Support concrete forms on the beams or girders by

continuous layers of an approved mastic or felt bearing material that will provide a mortar tight uniform bearing. Use a mastic or felt bearing material that has a minimum width of 1 inch and a maximum width of 1 1/2 inches. Seal joints between concrete form panels with caulking, tape, or other approved method.

400-5.8.5 Placing of Concrete: Place the concrete in accordance with the requirements of 400-5.7.5. Immediately prior to placing the slab concrete, saturate concrete stay-in-place form panels with water.

400-5.8.6 Inspection: Inspect the concrete in accordance with the requirements of 400-5.7.6.

After the deck concrete has been in place for a minimum period of two days, inspect the forms for cracks and excessive form deflection, and test for soundness and bonding of the forms by sounding with a hammer as directed by the Engineer. Remove, for visual inspection, form panels found to be cracked that show evidence of leakage and form panels which have a deflection greater than adjacent panels by 1/2 inch or more which show signs of leakage. If sounding discloses areas of doubtful soundness to the Engineer, remove the form panels from such areas for visual inspection after the concrete has attained adequate strength. Remove permanent bridge deck form panels at no expense to the City.

At locations where sections of the forms have been removed, the Engineer will not require the forms to be replaced. Repair the adjacent forms and supports to present a neat appearance and to ensure their satisfactory retention. As soon as the form is removed, the Engineer will examine the concrete surfaces for cavities, honeycombing, and other defects. If irregularities are found, and the Engineer determines that these irregularities do not justify rejection of the work, repair the concrete as directed and provide a General Surface Finish in accordance with 400-15. If the concrete where the form is removed is unsatisfactory, as determined by the Engineer, additional forms shall be removed as necessary to inspect and repair the slab, and modify the methods of construction as required to obtain satisfactory concrete in the slab. Remove and replace all unsatisfactory concrete as directed at no expense to the City.

If the methods of construction and the results of the inspections as outlined above indicate that the Contractor has obtained sound concrete throughout the slabs, the Contractor may moderate the amount of sounding and form removal, when approved.

Provide all facilities for the safe and convenient conduct of the inspection procedures.

400-6 Underdrain and Weep Holes.

Provide weep holes in all abutments and retaining walls.

Provide a continuous underdrain for box culverts in accordance with Design Standard Index No. 289. Provide weep holes that are at least 3 inches in diameter and not more than 10 feet apart. Place the outlet ends of the weep holes just above the ground line in front of abutments and retaining walls. Cover the exterior openings of all weep holes with galvanized wire mesh and a minimum of 2 cubic feet of clean, broken stone or gravel wrapped in Type D 3 filter fabric, to allow free drainage but prevent the fill from washing through.

400-7 Placing Concrete.

400-7.1Weather Restrictions:

400-7.1.1 Concreting in Cold Weather: Do not place concrete when the air temperature at placement is below 40ºF.

Meet the air temperature requirements for mixing and placing concrete in cold weather as specified in Section 346. During the curing period, if NOAA predicts the ambient temperature to fall below 35ºF for 12 hours or more or to fall below 30ºF for more than 4 hours, enclose the structure in such a way that the air temperature within the enclosure can be kept above 50ºF for a period of 3 days after placing the concrete or until the concrete reaches a minimum compressive strength of 1,500 psi.

Assume all risks connected with the placing and curing of concrete. Although the Engineer may give permission to place concrete, the Contractor is responsible for satisfactory results. If the placed concrete is determined to be unsatisfactory, remove, dispose of, and replace the concrete at no expense to the City.

400-7.1.2 Concreting in Hot Weather: Meet the temperature requirements and special measures for mixing and placing concrete in hot weather as specified in Section 346.

When the temperature of the concrete as placed exceeds 75ºF, incorporate in the concrete mix a water-reducing retarder or water reducer if allowed by Section 346.

Spray reinforcing bars and metal forms with cool fresh water just prior to placing the concrete in a method approved by the Engineer.

Assume all risks connected with the placing and curing of concrete. Although the Engineer may give permission to place concrete, the Contractor is responsible for satisfactory results. If the placed concrete is determined to be unsatisfactory, remove, dispose of, and replace the concrete at no expense to the City.

400-7.1.3 Wind Velocity Restrictions: Do not place concrete for bridge decks if the forecast of average wind velocity at any time during the planned hours of concrete placement exceeds 15 mph. Obtain weather forecasts from the National Weather Service “Hourly Weather Graph” for the city closest to the project site.

400-7.2 Lighting Requirements: Provide adequate lighting for all concrete operations conducted at night. Obtain approval of the lighting system prior to starting the concrete operations.

400-7.3 Inspections before Placing Concrete: Do not place concrete until the depth and character of the foundation and the adequacy of the forms and falsework have been approved by the Engineer. Do not deposit any concrete until all reinforcement is in place and has been inspected and approved by the Engineer.

400-7.4 Exposure to Water: Do not expose concrete other than seal concrete in cofferdams to the action of water before final setting. Do not expose such concrete to the action of salt or brackish water for a period of seven days after placing the concrete. Protect the concrete during this period by keeping salt or brackish water pumped out of cofferdams.

400-7.5 General Requirements for Placing Concrete: Deposit concrete as nearly as possible in its final position. Do not deposit large quantities at one point and then run or work it along the forms. Take special care to fill each part of the forms, to work coarse aggregate back from the face, and to force concrete under and around reinforcing bars without displacing them.

Use a method and manner of placing concrete that avoids the possibility of segregation or separation of aggregates. If the Engineer determines that the quality of concrete as

it reaches its final position is unsatisfactory, remove it and discontinue or adjust the method of placing until the Engineer determines that the quality of the concrete as placed is satisfactory.

Use metal or metal-lined open troughs or chutes with no aluminum parts in contact with the concrete. As an exception, chutes made of aluminum with a protective coating for ready mixed concrete trucks, no longer than 20 feet, may be used. This exception does not apply to any other means of concrete conveyance. Where steep slopes are required, use chutes that are equipped with baffles or are in short lengths that reverse the direction of movement. Where placing operations would involve dropping the concrete freely more than 5 feet, deposit it through pipes, troughs, or chutes of sheet metal or other approved material. Use troughs, chutes, or pipes with a combined length of more than 30 feet only with the City's authorization. Keep all troughs, chutes, and pipes clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run or more often if necessary.

Place concrete against supporting material that is moist at the time of concrete placement. If additional water is required, uniformly apply it ahead of the concrete placement as directed by the Engineer. Do not place concrete on supporting material that is frozen. The Contractor may use a moisture barrier in lieu of controlling the foundation grade moisture when approved by the Engineer.

400-7.6 Placing Concrete by Belt Conveyor: Place concrete by means of a belt conveyor system with written City authorization. Remove conveyor belt systems which produce unsatisfactory results before continuing operations. Take concrete samples for assurance testing at the discharge end of the belt conveyor system. Make available to the Engineer the necessary platform to provide a safe and suitable place for sampling and testing. Remove any concrete placed in an unsatisfactory manner at no expense to the City before continuing operations.

Use conveyor belt systems that do not exceed a total length of 550 feet, measured from end to end of the total assembly. Arrange the belt assembly so that each section discharges into a vertical hopper arrangement to the next section. To keep segregation to a minimum, situate scrapers over the hopper of each section to remove mortar adhering to the belt and to deposit it into the hopper. Equip the discharge end of the conveyor belt system with a hopper and a chute or suitable deflectors to cause the concrete to drop vertically to the deposit area.

In order to avoid delays due to breakdowns, provide stand-by equipment with an alternate power source prior to the beginning of the placement.

After the beginning of the placement, direct the discharge from the belt conveyor so that the concrete always falls on freshly placed concrete.

400-7.7 Placing Concrete by Pumping: In general, use concrete pumping equipment that is suitable in kind and adequate in capacity for the work proposed. Use a pump discharge line that has a minimum diameter of 4 inches. Use a pump and discharge lines that are constructed so that no aluminum surfaces are in contact with the concrete being pumped. Operate the pump to produce a continuous stream of concrete, without air pockets. When using cement slurry or similar material to lubricate the discharge line when pumping begins, collect such material at the point of discharge. Dispose of the collected slurry in areas provided by the Contractor. Control the pump discharge locations so that the placement locations of the various LOTs of concrete represented by strength test cylinders can be identified in the event the test cylinders indicate

deficient strength. When concrete is placed by pumping, take all test samples of concrete at the end of the discharge line, except in accordance with the provisions of Section 346.

400-7.8 Consolidation: Consolidate the concrete by continuous working with a suitable tool in an acceptable manner, or by vibrating as set forth in 400-7.11. When not using vibrators, thoroughly work and compact all thin-section work with a steel slicing rod. Spade all faces, and flush the mortar to the surface by continuously working with a concrete spading implement.

400-7.9 Obstructions: In cases where, because of obstructions, difficulty is encountered in puddling the concrete adjacent to the forms, bring the mortar content of the mix into contact with the interior surfaces by vibrating the forms. Produce the vibrations by striking the outside surfaces of the forms with wooden mallets or by other satisfactory means. In placing concrete around steel shapes place it only on one side of the shape until it flushes up over the bottom flange of the shape on the opposite side, after which place it on both sides to completion. After the concrete has taken its initial set, exercise care to avoid jarring the forms or placing any strain on the ends of projecting reinforcing bars.

400-7.10 Requirements for Successive Layers: Place concrete in continuous horizontal layers, approximately 20 inches thick. To avoid obtaining a plane of separation or a cold joint between layers, vibrate the concrete in accordance with 400-7.11.

400-7.11 Vibration of Concrete:

400-7.11.1 General: Consolidate all concrete except seal, steel pile jackets, and concrete for incidental construction by the use of mechanical vibrators.

400-7.11.2 Vibrators: Provide adequate vibrators on the project that are approved by the Engineer before beginning concrete work. Generally, provide vibrators of the internal type. For thin sections, where the forms are especially designed to resist vibration, the Contractor may use external vibrators. Use a vibrator with a minimum frequency of 4,500 impulses per minute with sufficient intensity and duration to cause complete consolidation of the concrete without causing segregation of the materials. For vibrating thin, heavily reinforced sections, use heads of such size to secure proper vibration of the concrete without disturbance of either the reinforcing bars or the forms.

400-7.11.3 Number of Vibrators Required: Use a sufficient number of vibrators to secure the compaction of each batch before the next batch is delivered, without delaying the delivery. In order to avoid delays due to breakdowns, provide at least one stand-by vibrator, with an appropriate power source.

400-7.11.4 Method of Vibration: Use vibrators to consolidate properly placed concrete. Do not use them to move concrete about in the forms. Insert the vibrators in the surface of concrete at points spaced to ensure uniform vibration of the entire mass of the concrete. Insert the vibrator at points that are no further apart than the radius over which the vibrator is visibly effective. Allow the vibrator to sink into the concrete by its own weight, and allow it to penetrate into the underlying layer sufficiently so that the two layers are thoroughly consolidated together. After thoroughly consolidating the concrete, withdraw the vibrator slowly to avoid formation of holes.

400-7.11.5 Hand Spading: When necessary in order to secure well-filled forms, free from aggregate pockets, honeycomb, bubbles, etc., spade the concrete by hand, along the surfaces of the forms and in all corners, following the vibration.

400-7.12 Columns: Place concrete in columns in one continuous operation for each lift as shown in the Plans.

400-7.13 Slabs and Bridge Decks:

400-7.13.1 Bulkheads, Screed Rails, and Screeding Devices: Strike-off the concrete using an approved metal screed operating on rails or bulkheads. Use devices which do not contain aluminum parts. Prior to placing concrete, provide an approved screed capable of striking-off and screeding the surface of the slab or deck to the required shape. Set all necessary bulkheads and screed rails to the required grade. Use bulkheads, screed rails, and screeding devices that permit vertical profile adjustment to the grade, satisfactory for providing straight transverse slopes, differing transverse slopes broken as shown in the Plans and/or transverse slopes with changing grade along the longitudinal length of slab or deck. Locate the screed rails so the entire placement surface can be screeded to grade without using intermediate screed rails, unless approved otherwise by the Engineer.

Use a screed consisting of a truss or heavy beams that will retain it's shape under all working conditions, and a set of rotating drums with a diameter sufficient to carry a 2 inch mortar roll in front of and parallel to the axis of the drums, while making an initial pass. Adjust the drums to prevent mortar buildup forming behind the trailing edges of the drums. For long bridges, as defined in 400-15.2.5.1, provide a device that automatically smoothes the concrete surface to an untextured finish and that is attached to, and is moved by, the rolling drum screed. As an alternate to the drum type screed, a mechanical screed with a metal strike-off may be used. Equip the mechanical screed with mechanical vibrators to provide continuous uniform vibration to the entire length unless otherwise authorized by the Engineer. Small and irregularly shaped areas that cannot be mechanically screeded may be screeded in a manner approved by the Engineer.

400-7.13.2 Screed Demonstration: Subsequent to the placement of all reinforcing bars and prior to placing any slab or deck concrete, demonstrate that the proposed equipment and methods can finish the concrete to the specified grades while maintaining the specified cover over the reinforcement. Provide the demonstration over the entire length and width of the spans to be placed.

400-7.13.3 Screeding Operations: Perform concrete placement and screeding as independently controlled mechanical operations. Ensure that the passing of the screed and forward movement of the screeding equipment are independent of the movement of concrete placement equipment.

Level the concrete in front of the screed as near to the finished grade as possible to prevent the screed from rising off the rail and forming uneven ridges behind the screed. Pass the screed over the slab or deck as many times as necessary to obtain a satisfactory surface and provide a concrete surface true to grade and crown, and free of irregularities.

Do not add water to the concrete surface to assist in finishing operations unless specifically authorized by the Engineer. If the Engineer permits the addition of water, apply only a fog mist, above the concrete surface, by means of approved power driven spray equipment.

For long bridges, as defined in 400-15.2.5.1, do not manually or mechanically float the concrete surface or apply a texture by broom or any other device to the

concrete surface produced by the screeding process. Correct isolated surface irregularities in accordance with 400-15.2.5.3.

400-7.13.4 Placing Operations: Select an approved concrete design mix which ensures complete placement of all slab or deck concrete between construction joints before initial set begins in the plastic concrete. On placements of 50 yd^3 or less, the minimum placement rate is 20 cubic yards per hour. On placements of greater than 50 cubic yards, the minimum placement rate is 30 cubic yards per hour.

The Engineer will not permit slab or deck placements until an acceptable plan for meeting the minimum placement rate is approved.

400-7.13.5 Concrete Decks on Steel Spans: Where concrete decks are placed on steel spans, release the temporary supports under the bridge before placing any concrete.

400-7.13.6 Concrete Decks on T-Beams: For cast-in-place T-beam construction, cast the slabs and beams in one continuous operation. As an exception, where special shear anchorage or keys are provided for in the Plans or approved by the Engineer, the beams and slabs may be constructed in successive placements.

400-7.13.7 Diaphragms: Place concrete diaphragms at least 48 hours before the bridge deck slabs are placed unless otherwise indicated in the Plans.

400-7.13.8 Weather Protection: Provide an approved means of protecting unhardened concrete from rain. Position the protection system to shield the concrete from rain and running water. Provide a shield impervious to water over the slab or deck concrete, of sufficient size to protect all areas of slab or deck concrete subject to water damage, and include a means of intercepting and diverting water away from freshly placed concrete. Arrange the equipment so that the weather protection system can be erected over unhardened concrete. When there is a possibility of rain during concrete placement operations, place the weather protection system in stand-by readiness, capable of being deployed in a timely manner. Use the weather protection immediately when rain begins so that slab or deck concrete damage will not occur. Do not place concrete during rain.

Assume responsibility for damage to the slab or deck in the case of failure of the weather protection system.

400-7.14 Concrete Box Culverts: In general, place the base slab or footing of concrete box culverts, and allow them to set before constructing the remainder of the culvert. In this case, make suitable provision for longitudinal keys. Construct bottom slabs, footings, and apron walls as a monolith if practicable. Where transverse construction joints are necessary, place them at right angles to the culvert barrel, and make suitable provision for keys.

In the construction of box culverts having walls 6 feet or less in height, the sidewalls and top slab may be constructed as a monolith or may place the concrete in the walls and allow it to set before placing the top slab concrete.

Where the height of the box culvert walls exceed 6 feet, place the walls, and allow the concrete to set at least 12 hours before placing the top slab concrete. In such cases, form keys in the sidewalls.

When casting the walls and top slabs of box culverts as a monolith, ensure that any necessary construction joints are vertical. Design all construction joints with formed keys. Provide keys that are beveled as shown in the Plans or as directed, but do not allow the edge of the beveled material forming the key to be less than 1 1/2 inches from the edge of the concrete.

Construct each wingwall, if possible, as a monolith. Ensure that construction joints, where unavoidable, are horizontal and so located that no joints will be visible in the exposed face of the wing above the ground line.

Precast box culvert sections may be used in lieu of cast-in-place box culvert construction provided the provisions in Section 410 are satisfied.

400-8 Seals.

400-8.1 General: Wherever practicable, dewater all foundation excavations, and deposit the concrete in the dry as defined in 455-15.2. Where conditions are encountered which render it impracticable to dewater the foundation before placing concrete, the Engineer may authorize the construction of a concrete foundation seal of the required size. Then, dewater the foundation, and place the balance of the concrete in the dry.

When required to place seal concrete, the Contractor is responsible for the satisfactory performance of the seal in providing a watertight excavation for placing structural concrete. The City will provide and pay for the seal concrete as an aid to the construction of the structure. Repair seal concrete as necessary to perform its required function at no expense to the City.

400-8.2 Method of Placing: Carefully place concrete deposited under water in the space in which it is to remain by means of a tremie, a closed-bottom dump bucket of not less than 1 cubic yard capacity, or other approved method. Do not disturb the concrete after depositing it. Deposit all seal concrete in one continuous placement. Do not place any concrete in running water, and ensure that all form work designed to retain concrete under water is watertight.

400-8.3 Use of Tremie: Use a tremie consisting of a tube having a minimum inside diameter of 10 inches, constructed in sections having water-tight joints. Do not allow any aluminum parts to have contact with the concrete. Ensure that the discharge end is entirely seated at all times, and keep the tremie tube full to the bottom of the hopper. When dumping a batch into the hopper, keep the tremie slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper. Stop the flow by lowering the tremie. Support the tremie such as to permit the free movement of the discharge end over the entire top surface of the work and to permit its being lowered rapidly when necessary to choke off or retard the flow. Provide a continuous, uninterrupted flow until completing the work. Exercise special care to maintain still water at the point of deposit.

400-8.4 Time of Beginning Pumping: Do not commence pumping to dewater a sealed cofferdam until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72 hours after placement of the concrete.

400-9 Construction Joints.

400-9.1 Location: Make construction joints only at locations shown in the Plans or in the placement schedule, unless otherwise approved in writing. If not detailed in the Plans or placement schedule, or in case of emergency, place construction joints as directed.

400-9.2 Provisions for Bond and Transmission of Shear: Use shear key reinforcement where necessary to transmit shear or to bond the two sections together.

400-9.3 Preparations of Surfaces: Before depositing new concrete on or against concrete which has hardened, re-tighten the forms. Roughen the surface of the hardened concrete in a

manner that will not leave loosened particles, aggregate, or damaged concrete at the surface. Thoroughly clean the surface of foreign matter and laitance, and saturate it with water.

400-9.4 Placing Concrete: Continuously place concrete from joint to joint. Carefully finish the face edges of all joints which are exposed to view true to line and elevation.

400-9.5 Joints in Sea Water or Brackish Water: For concrete placed in sea water or brackish water, do not place any construction joints between points 2 feet below the mean low water elevation and 6 feet above the mean high water elevation.

400-9.6 Joints in Long Box Culverts: For long concrete box culverts, vertical construction joints may be placed at a spacing not less than 30 feet. When using transverse construction joints, ensure that longitudinal reinforcing is continuous through the joint and that the joint is vertical.

400-9.7 Crack Control Grooves in Concrete Bridge Decks: When the Plans require crack control grooves in the top surface of decks, either install a tooled "V" groove prior to initial concrete set or saw a groove using an early entry dry cut saw. When using an early entry dry cut saw, operate in accordance with the manufacturer's recommendations. Commence sawing as soon as the concrete has hardened enough to permit standing on the surface without leaving visible tracks or impressions and before uncontrolled concrete cracks occur.

400-10 Expansion Joints.

400-10.1 General: After meeting the smoothness criteria in 400-15, construct expansion joints to permit absolute freedom of movement. Carefully remove all loose or thin shells of mortar likely to cause a spall with movement at a joint from all expansion joints as soon as possible.

400-10.2 Sealed Joints: Fill expansion joints with a preformed joint filler. Cut the filler to conform to the cross-section of the structure, and furnish it in as few pieces as practicable, using only a single piece in each curb section. Do not use small pieces that would tend to come loose. Prepare joints to be sealed and apply the sealer in accordance with approved manufacturer's directions.

400-10.3 Joint System Installation: Install expansion joints before or after the deck planing required by 400-15.2.5.5 following the manufacturer's instructions. When installed after deck planing, install the edge rail assemblies in the blockouts on a profile tangent between the ends of the deck and/or approach slab to within a plus 0 and minus1/4 inch variation.

When installed before deck planing, install the edge rail assemblies 3/8 inch, plus or minus 1/16 inch, below the top surface of the deck or approach slab to compensate for concrete removal during planing.

400-11 Contact and Bearing Surfaces.

400-11.1 Separation of Surfaces: In general, separate all contact surfaces between superstructure and substructure or end walls and between adjacent superstructure sections by a layer of ASTM D6380 Class S, Type III organic felt.

400-11.2 Finishing of Bearing Surfaces: Construct bearings surfaces (areas) to the tolerances as specified herein and in the other parts of the Contract Documents. When using neoprene bearing pads, finish the concrete surface to a uniform 'rough' texture using a burlap drag, fine bristle broom or float. For metal or high load rotational bearings, fill minor depressions, 1/8 inch maximum, caused by finishing, bush hammering, or grinding with a low- viscosity epoxy meeting the requirements of 926-1, Type F-2, applied by the use of a squeegee. Bearing surfaces

may be ground to final position with carborundum. Check all bearing surfaces with a metallic straightedge prior to setting bearings or neoprene pads.

400-11.2.1 Deviation from Specified Elevations for Steel Beam Superstructures: Construct to the elevation shown on the Plans plus or minus 0.01 feet and do not exceed a 0.01 feet difference between specified elevations of bearing areas of adjacent bearings measured between the centerlines of bearing areas.

400-11.2.2 Deviation from Specified Elevations for Concrete Beam Superstructures: Construct to the elevation shown on the Plans plus or minus 0.02 feet.

400-11.2.3 Projecting Irregularities: Projecting irregularities will not exceed 1/16 inch.

400-11.2.4 Variations in Flatness for Neoprene Pads: In any direction, the pad is to be flat to within 1/16 inch. Pads designated to be sloped are not to deviate from the theoretical slope by the same amount.

400-11.2.5 Variations in Flatness for Metal or High Load Rotational Bearings: Construct the bearing area to the tolerance indicated for the measured length along the orthogonal axes.

Bearing area length up to 30 inches long to plus or minus 1/16 inch.

Bearing area length over 30 inches up to 45 inches long to plus or minus 3/32 inch.

Bearing area length over 45 inches long to plus or minus 1/8 inch.

400-11.3 Bearing Pads: Use bearing pads for seating bridge shoes, ends of beams, and slabs of the types specified or required in the Plans.

Furnish and install composite neoprene pads as detailed in the Plans. Place neoprene pads, where specified or required, directly on masonry surfaces finished in accordance with the requirements of this Article. Ensure that pads, bearing areas of bridge seats, and metal bearing plates are thoroughly cleaned and free from oil, grease, and other foreign materials.

Exercise care in fabrication of related metal parts to avoid producing conditions detrimental to the performance of the pads, such as uneven bearing, excessive bulging, etc.

The Engineer will evaluate the degree of deformation and condition of bearing pads in the completed bridge on or before the final inspection required by 5-10 or when requested by the Contractor. As directed by the Engineer, correct horizontal bearing pad deformations that at the time of inspection exceed 50% of the bearing pad thickness or that the Engineer predicts will exceed 50% of the bearing pad thickness during future high or low temperature periods. Payment for this correction effort will be considered extra work in accordance with 4-3.

400-12 Anchor Bolts and Dowels.

Set anchor bolts and dowels as specified in Section 460. Galvanize all anchor bolts as specified in Section 962.

400-13 Epoxy Bonding Compounds.

Where epoxy bonding compounds for bonding concrete are specified or required, apply the epoxy bonding materials only to clean, dry, structurally sound concrete surfaces. Provide surface preparation, application, and curing of epoxy bonding compound in strict accordance with

the manufacturer's recommendations for each particular application. Use an epoxy bonding compound listed on the City's APL.

400-14 Removal of Forms.

Use the table below as the criterion for minimum time or compressive strength required before removal of forms or supports.

When using the time period criterion, include in the time period all days except days in which the temperature falls below 40ºF.

Use the specified 28-day minimum compressive strength value as stated in 346-3.1 for each Class of Concrete utilized.

Location of Concrete Placement	Minimum Time for Form Removal for any Strength Concrete*	Minimum (%) of 28-day Compressive Strength for Form Removal
(1) Deck slabs, top slabs of culverts and bottom of caps, forms under sidewalks, and safety curb overhangs extending more than 2 feet		
(a) Class II (Bridge Deck)	7 days**	75**
(b) Class II (Other than Bridge Deck)	7 days	75
(c) Class III	7 days	70
(d) Class IV	7 days	60
(e) Class V	7 days	50
(2) Walls, piers, columns, sides of beams and other vertical surfaces	24 hours***	50***
(3) Front face form of curbs	6 hours	70
* For mass concrete, remove forms in accordance with 346-3.3 ** Reference 400-16.4 ***Do not place additional load on the section until 70% of the specified 28-day concrete strength is attained. Also, refer to 400-7.4.		

When using the percent of required strength, cast test cylinders for each mix for compressive strength determination or develop a curing concrete strength versus time curve (S/T Curve) which can be used in lieu of multiple test cylinders to determine when percent of required strength has been met.

Prior to curve use; obtain the Engineer's approval of the S/T Curve and its supporting data. An approved testing laboratory may be used to provide this information with approval of the Engineer. Plot S/T Curves using at least three different elapsed times that begin once test cylinders are cast; however, one of the elapsed times must be prior to the Contractor's intended form removal. Each elapsed time plotted must have a corresponding compressive strength computed by averaging the compressive strength of two test cylinders.

Cure such test cylinders as nearly as practical in the same manner as the concrete in the corresponding structural component, and test them in accordance with ASTM C39 and ASTM C31. Perform cylinder casting, curing, and testing at no expense to the City and under the observation of the Engineer. When the S/T Curve indicates a compressive strength equal to or greater than the percentage of specified strength shown in the table above for form removal, the Contractor may remove the forms. When the ambient air temperature falls 15ºF or more below the ambient air

temperature that existed during development of a S/T Curve, use a S/T Curve that corresponds to the lower temperature and that is developed in accordance with this section.

Do not remove forms at any time without the consent of the Engineer. Even when the Engineer provides consent to remove the forms, the Contractor is responsible for the work.

400-15 Finishing Concrete.

400-15.1 General Surface Finish (Required for All Surfaces): After placing and consolidating the concrete, strike-off all exposed surfaces to the lines and grades indicated in the Plans in a manner that will leave a surface of uniform texture free of undesirable surface irregularities, cavities, and other defects. Cut back metal ties supporting reinforcement, conduit, and other appurtenances a minimum of 1 inch from finished surface. After removing excess mortar and concrete and while the concrete is still in a workable state, carefully tool all construction and expansion joints. Leave joint filler exposed for its full length with clean edges. Ensure that finished work in addition to that specified above is compatible and complementary to the class of surface finish required.

Remove all laitance, loose material, form oil and curing compound from exposed surfaces that do not require forming and from exposed surfaces requiring forming, after form removal. Remove fins and irregular projections flush with the surface. Clean, saturate with water, and fill all holes, tie cavities, honeycomb, chips and spalls. Prior to filling, prepare the surface to ensure that patching mortar will bond to the existing concrete. Exercise care during the roughening process to prevent excessive defacement and damage to the surface of the existing concrete. Use patching mortar blended from the mix ingredients of the existing concrete. Ensure the patching mortar closely matches the color of the existing concrete when fully cured. As an alternative, mortar consisting of the following materials may be used: 4 parts of ordinary gray portland cement, 1/2 part of white portland cement, 1 part of fly ash and 2 to 4 parts of sand. The blended mortar must closely match the color of the filled element once fully cured and the proportion of white portland cement may be adjusted to achieve as close a match as possible. Regardless of the type patching mortar used, provide a mortar surface closely resembling the existing surface.

Cure the newly placed mortar using a curing blanket or a Type I clear curing compound at a uniform coverage as recommended by the manufacturer, but not less than 0.06 gallon per square yard.

In the event unsatisfactory surfaces are obtained, repair these surfaces by methods approved by the Engineer or the affected concrete will be rejected. Repair any surface or remove rejected concrete at no expense to the City.

400-15.2 Surface Finishes:

400-15.2.1 General: In addition to the general surface work specified for all exposed concrete surfaces, the Engineer may require one of the classes of surface finish listed below. For all such exposed surfaces, begin finish work for the applicable class specified, along with the general finish work, immediately after removal of the forms. In order to further ensure the required quality of the finish, remove forms no later than the minimum time specified for the forms to remain in place. Satisfactorily repair finished concrete surfaces which are subsequently disfigured or discolored at no expense to the City.

Provide the required class of surface finish for the various items of structural concrete as shown in the Plans.

400-15.2.2 Class 1 Surface Finish: As soon as the pointing has sufficiently set, thoroughly saturate the exposed surfaces with water, and rub them with a medium coarse carborundum stone. Continue rubbing until the surface has been ground to a paste and remove all form marks, irregularities, and projections. In this process, do not introduce any additive material other than water. After the rubbing has produced a smooth surface of uniform color, allow the material which has been ground to a paste to reset under proper curing conditions. Subsequently, as a second operation, re-saturate the concrete surfaces with water, and thoroughly rub them with a fine carborundum stone. Continue this rubbing until the surface has a smooth, fine grain texture of uniform color.

The Contractor may substitute a Class 5 applied finish coating in accordance with 400-15.2.6 as an alternate surface finish on all areas where Class 1 surface finish is specified.

400-15.2.3 Class 2 Surface Finish: As soon as pointing has sufficiently set, thoroughly saturate the exposed concrete surfaces with water and rub them with a medium coarse carborundum stone. Continue rubbing until the surface has been ground to a paste and remove all form marks, irregularities, and projections. In this process, do not introduce any additive material other than water.

After rubbing has produced a smooth surface finish, of uniform color, carefully brush the material which has been ground to a paste to a uniform texture, and allow it to reset under proper curing conditions. Carefully protect these surfaces from disfigurement and discoloration during subsequent construction operations.

400-15.2.4 Class 3 Surface Finish: Where this surface finish is specified, use forms with a form liner. Where specified or required on the Plans, use No. 89 coarse aggregate for concrete.

After concrete has been placed in the forms and compacted, finish all exposed surfaces which are not contained by the forms to produce a surface texture as nearly equal to that produced by the form as practicable. Generally, finish unformed surfaces to a smooth, dense surface with a steel trowel.

Perform all work, including general surface finish work, in a manner that will preserve the same surface texture and color produced by the form liner. Pointed areas may be rubbed with a dry carborundum stone.

400-15.2.5 Class 4 Deck Finish:

400-15.2.5.1 General: Apply a Class 4 finish on bridge decks and concrete approach slabs. On Short Bridges (bridges having a length less than or equal to 100 feet), and on Miscellaneous Bridges (Pedestrian, Trail and Movable Spans) regardless of length, meet the finish and smoothness requirements of 400-15.2.5.2 and 400-15.2.5.4. On Long Bridges (bridges having a length greater than 100 feet) meet the finish and smoothness requirements of 400-15.2.5.3 and 400-15.2.5.5. When an existing bridge deck is widened, see the Plans for the finish and smoothness requirements of the existing bridge deck and its new widened section. After meeting the screeding requirements of 400-7.13 and curing requirements of 400-16 and the smoothness requirements, herein, groove the bridge deck and approach slabs.

Regardless of bridge length, finish decks with less than 2 1/2 inches of top cover in accordance with the requirements for Short Bridges.

400-15.2.5.2 Plastic Surface Finish for Short and Miscellaneous Bridges: After screeding is completed, check the surface of the plastic concrete with a 10 foot straightedge, positioning and half-lapping the straightedge parallel to the centerline to cover the entire surface. Immediately correct deficiencies of more than 1/8 inch, measured as an ordinate between the surface and the straightedge.

Finish the concrete surface to a uniform texture using a burlap drag, fine bristle broom or float. Finish the deck to a smooth surface having a sandy texture without blemishes, marks or scratches deeper than 1/16 inch.

400-15.2.5.3 Plastic Surface Finish for Long Bridges: Do not moisten, manually float or apply texture to the concrete surface after the screed, with attached smoothing device, has passed unless correction of isolated surface irregularities is warranted and this should be done as soon as possible after screeding while the concrete is plastic. Correct all flaws such as cavities, blemishes, marks, or scratches that will not be removed by planing.

If the Engineer permits the addition of water when correcting flaws, apply moisture to the concrete surface only if required and only in the immediate vicinity of the isolated irregularity. Apply a quantity of moisture not greater than what is needed to facilitate correction of the irregularity and apply only a fog mist, above the concrete surface, by power driven spray equipment approved by the Engineer.

400-15.2.5.4 Smoothness Requirements for Short Bridges and Miscellaneous Bridges (including approach slabs): Perform a final straightedge check with a 10 foot straightedge, positioning and half-lapping the straightedge parallel to the centerline, approximately 5 feet apart to cover the entire surface. Correct all irregularities greater than 3/16 inch measured as an ordinate to the straightedge, by grinding. Perform grinding by the abrasive method using hand or power tools or by machine, to leave a smooth surface within a 1/8 inch tolerance.

400-15.2.5.5 Smoothness Evaluation and Concrete Surface Planing, Long Bridges (including approach slabs): Prior to planing, provide a smoothness evaluation of the completed bridge deck and exposed concrete surfaces of approach slabs by a computerized Cox California-type profilograph in accordance with the criteria herein and FM 5-558E. Furnish this evaluation through an independent provider approved by the Engineer, using equipment calibrated by the Engineer. All bridge deck and concrete approach slab surfaces to within 2 feet of gutter lines are subject to this smoothness evaluation.

Prior to initial profilograph testing, complete work on the bridge deck and approach slabs. Thoroughly clean and clear the bridge deck and approach slab areas to be evaluated for smoothness of all obstructions and provide the smoothness evaluation. Ensure that no radio transmissions or other activities that might disrupt the automated profilograph equipment are allowed during the evaluation.

Average the Profile Index Value for the bridge deck, including the exposed concrete surfaces of the approach slabs, for the left and right wheel path of each lane. The maximum allowable Profile Index Value for acceptable smoothness is 10 inches per mile utilizing the 0.2 inch blanking band. Apply these criteria to a minimum of 100 feet of each lane.

Additionally, correct individual bumps or depressions exceeding a cutoff height of 0.3 inch from a chord of 25 feet (see ASTM E1274) on the profilograph trace. Ensure that the surface meets a 1/4 inch in 10 feet straightedge check made transversely across the deck and approach slabs if determined necessary by the Engineer. Provide additional profilograph testing as necessary following longitudinal planing and any other actions taken to improve smoothness, until a profile meeting the acceptance criteria is obtained.

Regardless of whether expansion joints are installed before or after deck planing is complete, plane off the concrete deck surface to a minimum depth of 1/4 inch and also meet or exceed the profilograph smoothness criteria. Longitudinally plane the entire bridge deck and exposed concrete surfaces of the approach slabs using a self-propelled planing machine with gang mounted diamond saw cutting blades specifically designed for such work. Use the profilograph generated smoothness data, to establish the optimum planing machine settings. Plane the deck surface to within 2 feet of the gutter line so that there is a smooth transition, without vertical faces or sudden surface discontinuities, from the fully planed surface to the unplaned surface. Use a machine with a minimum wheel base length of 15 feet, constructed and operated in such manner that it does not cause strain or damage to deck or approach slab surfaces, excessive ravels, aggregate fractures or spalling. The equipment shall be approved by the Engineer. Perform longitudinal planing parallel to the roadway centerline, and provide a consistent, textured surface. Clean the surface of all slurry/debris generated during this work concurrently with operation of the machine.

After the deck has been planed the minimum 1/4 inch, reevaluate the surface smoothness using the profilograph testing described above. Perform cycles of planing and profilograph retesting as necessary until the deck and exposed concrete surfaces of approach slabs are in compliance with the smoothness criteria but do not exceed the maximum concrete removal depth of 1/2 inch.

400-15.2.5.6 Grooving: After the concrete surface profile, as required by 400-15.2.5, has been accepted by the Engineer, and prior to opening the bridge to traffic, groove the bridge deck and approach slabs perpendicular to the centerline of the structure. Do not groove the deck surface of pedestrian or trail bridges unless otherwise shown in the Contract Documents. Cut grooves into the hardened concrete using a mechanical saw device which will leave grooves nominally 1/8 inch wide and 3/16 inch deep. Space the grooves apart in random spacing center of grooves in the following sequence: 3/4 inch, 1-1/8 inch, 5/8 inch, 1 inch, 5/8 inch, 1-1/8 inch, 3/4 inch in 6 inch repetitions across the width to be grooved in one pass of the mechanical saw device. One 6 inch sequence may be adjusted by 1/4 sequence increments to accommodate various cutting head widths provided the general pattern is carried out. The tolerance for the width of the grooves is plus 1/16 inch to minus 0 inch and the tolerance for the depth of grooves is plus or minus1/16 inch. The tolerance for the spacing of the grooves is plus or minus1/16 inch.

Cut grooves continuously across the deck or approach slab to within 18 inches of gutter lines at barrier rail, curb line and median divider. At skewed metal expansion joints in bridge deck surfaces, adjust groove cutting by using narrow width cutting heads so that all grooves of the bridge deck surface or approach slab surface end within 6 inches, measured normal to centerline of the joint, leaving no ungrooved surface adjacent to each side of the joint greater than 6 inches in width. Ensure that the minimum distance to the first groove, measured normal

from the edge of the concrete joint or from the junction between the concrete and the metal leg of the armored joint angle, is 1 inch. Produce grooves that are continuous across construction joints or other joints in the concrete surface less than 1/2 inch wide. Apply the same procedure described above where the gutter lines at barrier rails, curb lines and median dividers are not parallel to the centerline of the bridge to maintain the 18 inches maximum dimension from the grooves to the gutter line. Cut grooves continuously across formed concrete joints.

400-15.2.6 Class 5 Applied Finish Coating:

400-15.2.6.1 General: Place an applied finish coating upon all concrete surfaces where the Plans indicate Class 5 Applied Finish Coating. Apply the finish coating after completion of the general surface work specified for all exposed concrete surfaces. Select an Applied Finish Coating from the APL meeting the requirements of Section 975.

400-15.2.6.2 Material: For the coating material, use a commercial product designed specifically for this purpose. Use only coating material that is manufactured by one manufacturer and delivered to the job site in sealed containers bearing the manufacturer's original labels. Submit the manufacturer's written instructions to the Engineer.

400-15.2.6.3 Surface Preparation: Prepare the surface prior to the application of an applied finish coating by providing a surface finish in accordance with the requirements of 400-15.1. The Engineer will not require surface voids that are 1/4 inch or less in width and depth to be grouted prior to application of the finish coating. Fill surface void larger than 1/4 inch in width and depth an approved high strength, non metallic, non shrink grout meeting the requirements of Section 934, mixed and applied in accordance with the manufacturer's recommendations. Apply the grout by filling the surface voids using burlap pads, float sponges, or other acceptable methods. As soon as the grout has taken its initial set, brush the surface to remove all loose grout, leaving the surface smooth and free of any voids. Ensure that the surface to be coated is free from efflorescence, flaking coatings, curing compound, dirt, oil, and other substances deleterious to the applied finish coating. Prior to application of the finish coating onto precast or cast-in-place concrete surfaces, test the concrete surface at 30 foot intervals for the presence of curing compound using one or two drops of muriatic acid placed on the concrete surface. If curing compound is present, there will be no reaction between the acid and the concrete. If there is no reaction, remove the compound by pressure washing the concrete surfaces. Prepare the surfaces in accordance with the manufacturer's recommendations, and ensure that they are in a condition consistent with the manufacturer's requirements. Clean surfaces of existing structures in accordance with 400-19.

400-15.2.6.4 Application: Apply the finish coating utilizing a method recommended by the manufacturer. When applying the finish coating by spraying, supply heavy duty spray equipment capable of maintaining a constant pressure necessary for proper application. Mix and cure all coating materials in accordance with the manufacturer's written instructions. Apply the finished coating at a rate of 50, plus or minus 10 square feet per gallon.

400-15.2.6.5 Finished Product: Produce a texture of the completed finish coat that is generally similar to that of rubbed concrete. Ensure that the completed finished coating is tightly bonded to the structure and presents a uniform appearance and texture. If necessary, apply additional coats to produce the desired surface texture and uniformity.

Upon failure to adhere positively to the structure without chipping, flaking, or peeling, or to attain the desired surface appearance, remove coatings entirely from the structure, and reapply the finish coating after surface preparation until achieving the desired finished product. Do not allow the average thickness of the completed finish coating to exceed 1/8 inch.

400-15.2.6.6 Material Tests and Certification: Before any portion of any shipment of finish coating is applied on the project, submit to the Engineer a certificate from the manufacturer attesting that the commercial product furnished conforms to the same formula as that previously subjected to the tests specified in Section 975. In addition, submit the following product analysis, obtained from the manufacturer, for each batch of the material used:

1. Weight per gallon.
2. Consistency (Krebs Units).
3. Weight percent pigment.
4. Weight percent vehicle solids.
5. Infra-red spectra of vehicle solution.

400-15.2.7 Final Straightedging for Surfaces to Receive Asphalt Concrete Surface: Test the slab surfaces of poured-in-place decks which are to be surfaced with an asphalt concrete wearing course for trueness with a 10 foot straightedge, as specified above. As an exception, correct only irregularities of more than 1/4 inch measured as an ordinate (either above or below the general contour of the surface). The Engineer will not require belting or brooming of slabs that are to be surfaced with an asphalt concrete wearing course. For curing, meet the requirements specified for other deck slabs.

400-15.2.8 Finishing Bridge Sidewalks: Finish bridge sidewalks in accordance with the applicable requirements of Section 522.

400-16 Curing Concrete.

400-16.1 General: Cure cast-in-place and precast (non-prestressed) concrete as required herein for a minimum duration of 72 hours. If forms are loosened or removed before the 72 hour curing period is complete, expand the curing to cover these surfaces by either coating with curing compound or extending the continuous moist cure area.

Until curing has begun, retain concrete surface moisture at all times by maintaining a surface moisture evaporation rate less than 0.1 pound per square foot per hour. Periodically, at the site of concrete placement prior to and during the operation, measure the ambient air temperature, relative humidity and wind velocity with industrial grade weather monitoring instruments to determine the on-site evaporation rate. If the evaporation is, or is likely to become 0.1 pound per square foot per hour or greater, employ measures to prevent moisture loss such as application of evaporation retarder, application of supplemental moisture by fogging or reduction of the concrete temperature during batching. Compute the evaporation rate by using the nomograph in the ACI manual of Concrete Practice Part 2, Section 308R Guide to Curing Concrete, or by using an evaporation rate calculator approved by the Engineer.

400-16.2 Methods: Except where other curing methods are specified, select from the following options the chosen method(s) for curing all concrete components.

1. Continuous Moisture: Place burlap on the surface and keep it continuously saturated for the curing period by means of soaker hoses or automatic sprinklers. Water flow may be metered to cycle repetitively for five minutes on and five minutes off during the 72 hour curing period. Do not apply moisture manually. If side forms are loosened or removed during the curing period, extend the burlap so as to completely shield the sides of the members.

2. Membrane Curing Compound: Apply a white Type 2 curing compound to all surfaces at a uniform coverage as recommended by the manufacturer but not less than 0.06 gallon per square yard. Allow surfaces covered by the membrane curing compound to remain undisturbed for the curing period. Recoat any cracks, checks or other defects in the membrane seal which are detected during the curing period within one hour. If side forms are loosened during the curing period, maintain surface moisture and remove the forms within one hour and immediately coat the formed surfaces with a membrane curing compound. Bottom surfaces shall be similarly coated after removal of or from the forms.

If curing compound is to be applied by spraying, use a compressor driven sprayer of sufficient size to provide uniform mist. Standby equipment is required in case of mechanical failure and hand held pump-up sprayers may be used only as standby equipment.

3. Curing Blankets: Curing blankets may be used for curing the top surfaces of members while the member side forms remain in place. Do not use curing blankets which have been torn or punctured. Securely fasten all edges to provide as tight a seal as practical. Should the system fail to maintain a moist condition on the concrete surface, discontinue use of the blankets and continue curing using another method. Keep curing blankets in place for the duration of the curing period.

4. Accelerated Cure:

a. General: Accelerated curing of the concrete can be achieved by use of either low pressure steam curing, radiant heat curing or continuous moisture and heat curing. If accelerated curing is completed before the 72 hour curing period has elapsed, continue curing for the remaining part of the 72 hour curing period in accordance with one of the curing methods listed above.

If accelerated curing is used, furnish temperature recording devices that will provide accurate, continuous and permanent records of the time and temperature relationship throughout the entire curing period. Provide one such recording thermometer for each 200 feet of placement length or part thereof. Initially calibrate recording thermometers and recalibrate at least annually.

The preheating period shall equal or exceed the time of initial set as determined by ASTM C403 and shall not be less than 4 hours. When the ambient air temperature is above 50ºF, allow the member to remain undisturbed in the ambient air for the preheating period. If the ambient air temperature is below 50ºF, apply heat during the preheating period to hold the air surrounding the member at a temperature of 50 to 90ºF.

To prevent moisture loss from exposed surfaces during the preheating period, enclose members as soon as possible after casting or keep the surfaces wet by fog mist or wet blankets. Use enclosures for heat curing that allow free circulation of heat about the member with a minimum moisture loss. The use of tarpaulins or similar flexible covers may be

used provided they are kept in good repair and secured in such a manner to prevent the loss of heat and moisture. Use enclosures that cover the entire placement.

During the application or removal of the heat, do not allow the temperature rise or fall within the enclosure to exceed 40ºF per hour. Do not allow the curing temperature throughout the enclosure to exceed 160ºF. Maintain the curing temperature within a temperature range of 130 to 160ºF until the concrete has reached the required form removal strength for precast and cast-in-place components or the required release strength for prestressed concrete components.

b. Low-Pressure Steam: The steam used shall be in a saturated condition. Do not allow steam jets to impinge directly on the concrete, test cylinders, or forms. Cover control cylinders to prevent moisture loss and place them in a location where the temperature is representative of the average temperature of the enclosure.

c. Curing with Radiant Heat: Apply radiant heat by means of pipes circulating steam, hot oil or hot water, or by electric heating elements. Do not allow the heating elements to come in direct contact with the concrete or the forms. Distribute sources of heat in a manner that will prevent localized high temperatures above 160ºF. To prevent moisture loss during curing, keep the exposed surfaces wet by fog mist or wet blankets.

d. Continuous Moisture and Heat: This method consists of heating the enclosure in combination with the continuous moisture method described above.

In addition to the curing blankets, an auxiliary cover for retention of the heat will be required over the entire placement. Support this cover at a sufficient distance above the placement being cured to allow circulation of the heat.

400-16.3 Silica Fume Concrete: Cure silica fume concrete a minimum of 72 hours using continuous moisture cure. No substitution of alternative methods nor reduction in the time period is allowed. After completion of the 72 hour curing period, apply a membrane curing compound to all concrete surfaces. Apply curing compound according to 400-16.2.

400-16.4 Bridge Decks and Approach Slabs: Cure bridge decks and approach slabs for a duration of seven days. Apply a membrane curing compound to the top surface in accordance with 400-16.2 using a compressor driven sprayer. In general, apply curing compound when the surface is damp and after all pooled water has evaporated. For Short bridges, begin applying curing compound immediately after the initially placed concrete has been floated, straightedged, textured and a damp surface condition exists and continue applying compound as concrete placement progresses with as little interruption as possible until the entire top surface has been coated with compound. For Long bridges, begin applying curing compound to the initially placed concrete as soon as a damp surface condition exists and continue applying compound as concrete placement progresses with as little interruption as possible until the entire top surface has been coated with compound. For all bridges, the elapsed time between the initial placement of deck or approach slab concrete and the completed application of curing compound must not exceed 120 minutes. The 120 minute limit may be extended by the Engineer if project specific factors (cool temperatures, high humidity, retarding admixtures, etc.) prolong wet surface conditions.

Prior to the first deck or approach slab placement, submit to the Engineer the method that will be used to periodically measure the rate of application of curing compound in, gallons per square foot as the concrete placement progresses. Prior to the placement of each deck

or approach slab, submit to the Engineer the anticipated quantity of curing compound in gallons along with the corresponding square feet of concrete to be covered to meet the coverage rate in 400-16.2. Compute the actual quantity of curing compound applied at the conclusion of each concrete placement and submit the quantity to the Engineer. Apply the curing compound from a work platform.

Place curing blankets on all exposed surfaces which are not formed as soon as possible with minimal effect on the surface texture. Place the curing blankets with sufficient overlapping seams to form an effective moisture seal. Before using curing blankets, mend tears, splits, or other damage that would make them unsuitable. Discard curing blankets that are not repairable. Wet all curing blankets immediately after satisfactorily placing them and maintain them in a saturated condition throughout the seven day curing period. Supply sufficient quantity of water meeting the requirements of Section 923 at the job site for wetting the blankets.

Where a bridge deck or approach slab is to be subjected to walking, wheeling or other approved construction traffic within the seven day curing period, protect the curing blankets and the concrete surface from damage by placing wooden sheeting, plywood or other approved protective material in the travel areas.

When the ends of the curing blankets are rolled back to permit screeding of adjacent concrete, keep the exposed surfaces wet throughout the period of exposure.

Bridge deck bottom and side forms may be removed after 72 hours upon compliance with 400-14. Approach slab side forms may be removed after 72 hours. Apply membrane curing compound to all surfaces stripped of forms within one hour of loosening. Apply curing compound according to 400-16.2.

400-16.5 Construction Joints: Cure construction joint areas using either the continuous moisture or curing blankets method.

400-16.6 Traffic Barriers, Railings, Parapets and End Post: Ensure concrete is cured in accordance with 400-16.2(2), except that a clear Type 1-D curing compound that must contain a fugitive dye may be used in lieu of Type 2. If Type 1-D is used, its removal per 400-15.1 during finishing is not required. When construction is by the slip form method, coat all concrete surfaces with a curing compound that meets the requirements of 925-2, either within 30 minutes of extrusion or before the loss of water sheen, whichever occurs first. Ensure a curing compound coating period of not less than seven days after application. Prior to each concrete placement, submit to the Engineer the method that will be used to periodically measure the rate of application in gallons per square foot. Also, prior to each placement, submit to the Engineer the anticipated quantity of curing compound in gallons that will be used to meet the coverage rate specified in 400-16.2 along with the corresponding square footage of barriers, railings, parapets and end posts to be coated with that quantity. Measure the actual quantity of curing compound that is applied during each concrete placement and submit the quantity to the Engineer. Applied finish coatings, that are on the APL and that are flagged as permitted for use as a curing compound, may be used in lieu of a curing compound. If an applied finish coating is used in lieu of a curing compound, have a backup system that is in full compliance with 400-16.2(2) available at all times to ensure that an effective alternative system will be immediately available if the applied finish coating cannot be applied within 30 minutes of extrusion or before the loss of water sheen.

400-16.7 Removal of Membrane Curing Compounds: Provide the longest possible curing duration; however, remove curing compound on portions of members to be bonded to other concrete. Compounds may be removed by either sand or water blasting. Water blasting requires the use of water meeting the requirements of Section 923 and a minimum nozzle pressure of 2,900 psi.

400-17 Protection of Concrete.

400-17.1 Opening to Traffic: Do not open concrete bridge decks, approach slabs, or culverts to traffic for at least 14 days after concrete placement. During placement operations, concrete may be wheeled across previously placed slabs after they have set for 24 hours and plank runways are used to keep the loads over the beams.

400-17.2 Storing Materials on Bridge Slabs: Do not store heavy equipment or material, other than light forms or tools, on concrete bridge slabs or approach slabs until 14 days after they have been placed. Obtain approval from the Engineer prior to storing materials, tools or equipment on bridge decks at any time. Disperse any such loads to avoid overloading the structure.

400-17.3 Time of Placing Superstructure: Do not place the weight of the superstructure or beams on concrete substructure elements for at least 10 days after placement.

400-17.4 Alternate Procedure: As an alternative to the time delay periods set forth in 400-17.1 and 400-17.3, test cylinders may be prepared and tested by the Contractor in accordance with 346-5 and a determination made using one of the following methods:

1. When the cylinder test results indicate the minimum 28 day compressive strength shown in the Plans, concrete bridge decks, approach slabs, and culverts may be opened to traffic or the superstructure and beams may be placed on caps.

2. Submit signed and sealed calculations, prepared by a Specialty Engineer, demonstrating that the concrete caps can safely support the weight of the girders for the current concrete strength to the Engineer for approval.

In any event, comply with the curing provisions of 400-16.

400-18 Precast Planks, Slabs, and Girders.

400-18.1 General: Where so shown in the Contract Documents, the Contractor may construct concrete planks, slabs, girders, and other structural elements by precasting. In general, use a method that consists of casting structural elements in a casting yard, curing as specified in 400-16, transporting them to the site of the work, installing them on previously prepared supports and, where so shown in the Plans, joining them with poured-in-place slabs or keys. Handle and install precast prestressed members as specified in Section 450.

400-18.2 Casting: Cast precast elements on unyielding beds or pallets. Use special care in casting the bearing surfaces on both the elements and their foundations in order that these surfaces shall coincide when installing the elements. Check bearing surfaces on casting beds with a level and a straightedge prior to the casting. Similarly check corresponding surfaces on the foundations during finishing operations.

400-18.3 Poured-in-Place Keys: Where precast elements are to be joined with poured- in-place keys, carefully align the elements prior to pouring the keys.

400-18.4 Surface Finish: Finish the surface as specified in 400 15, except that where precast slabs and poured-in-place keys form the riding surface, give the entire surface a broomed finish.

400-18.5 Moving, Placing, and Opening to Traffic: Reinforced precast members may be moved from casting beds, placed in the structure, and opened to traffic at the ages shown in the following table:

Handling from casting beds to storage areas ..... 7 days
Placing in structure ..... 14 days

Opening to traffic:

Precast elements..... 14 days
Cast-in-place slabs over precast girders ..... 14 days
Cast-in-place keys joining precast slabs ..... 7 days

As an alternate procedure, in lieu of the time delay periods set forth above, test beams may be cast from representative concrete, and cure them identically with the concrete in the corresponding structural component. Test the test beams in accordance with ASTM C31 and ASTM C78. When the test results indicate a flexural strength of 550 psi, or more, any of the operations listed above may proceed without completing the corresponding time delay period.

400-18.6 Setting Prestressed Slabs: Before permitting construction equipment on the bridge to erect slab units, submit sketches showing axle loads and spacing and a description of the intended method of setting slab units to the Engineer for approval. Do not use axle loads, spacing, and methods of setting which produce stresses in the slab units greater than the allowable stress.

400-18.7 Protection of Precast Elements: The Contractor is responsible for the safety of precast elements during all stages of construction. The Engineer will reject any precast elements that become cracked, broken, seriously spalled, or structurally impaired. Remove rejected precast elements from the work at no expense to the City.

400-18.8 Form Material: Form material used to form hollow cores may be left in place. Ensure that the form material is neutral with respect to the generating of products harmful to the physical and structural properties of the concrete. The Contractor is responsible for any detrimental effects resulting from the presence of the form material within the precast element.

400-19 Cleaning and Coating Concrete Surfaces of Existing Structures.

For the purposes of this article, an existing structure is one that was in service prior to the start of the project to which this specification applies. For existing structures, clean concrete surfaces that are designated in the Contract Documents as receiving Class 5 applied finish coating by pressure washing prior to the application of coating. Use pressure washing equipment producing a minimum working pressure of 2,500 psi when measured at or near the nozzle. Do not damage or gouge uncoated concrete surfaces or previously coated concrete surfaces during cleaning operations. Remove all previously applied coating that is no longer adhering to the concrete or that is peeling, flaking or delaminating. Ensure that after the pressure wash cleaning and the removal of non-adherent coating, that the cleaned surfaces are free of efflorescence, grime, mold, mildew, oil or any other contaminants that might prevent proper adhesion of the new coating. After cleaning has been successfully completed, apply Class 5 Applied Finish Coating in accordance with 400-15.2.6 or as otherwise specified in the Plans.

400-20 Approach Slabs.

Construct approach slabs at the bridge ends in accordance with the applicable requirements of Section 350 using Class II (Bridge Deck) concrete. Place the reinforcement as specified in 350-7 and Section 415.

400-21 Disposition of Cracked Concrete.

400-21.1 General: The disposition of cracked concrete is described in this Article and applies to all cast-in-place concrete members, and once installed, to the precast and prestressed concrete members that are produced in accordance with 410, 450, 521, 534, 548 and 641.

400-21.2 Investigation, Documentation and Monitoring: The Engineer will inspect concrete surfaces as soon as surfaces are fully visible after casting, with the exception of surfaces of precast concrete products produced in offsite plants, between 7 and 31 days after the component has been burdened with full dead load, and a minimum of 7 days after the bridge has been opened to full unrestricted traffic. The Engineer will measure the width, length and depth of each crack and establish the precise location of the crack termination points relative to permanent reference points on the member. The Engineer will determine if coring of the concrete is necessary when an accurate measurement of crack depth cannot be determined by use of a mechanical probe. The Engineer will monitor and document the growth of individual cracks at an inspection interval determined by the Engineer to determine if cracks are active or dormant after initial inspection. The Engineer will perform all final bridge deck crack measurements once the deck is free of all debris and before transverse grooves are cut and after planing is complete for decks that require planing.

Provide the access, equipment and personnel needed for the Engineer to safely perform this work at no expense to the City. Core cracks for use by the Engineer in locations and to depths specified by the Engineer at no expense to the City.

400-21.3 Classification of Cracks: The Engineer will classify cracks as either nonstructural or structural and determine the cause. In general, nonstructural cracks are cracks 1/2 inch or less deep from the surface of the concrete; however, the Engineer may determine that a crack greater than 1/2 inch deep is nonstructural. In general, structural cracks are cracks that extend deeper than 1/2 inch. As an exception, all cracks in concrete bridge decks that are supported by beams or girders will be classified as nonstructural and repair will be in accordance with 400-21.5.1. However, if the Engineer determines that repair under 400-21.5.1 is unacceptable, repair in accordance with 400-21.5.2.

A crack that is fully or partially underwater at any time during its service life will be classified as a structural crack unless the Environment note on the General Notes sheet in the Plans categorizes the substructure as slightly aggressive, in which case, the nonstructural crack criteria may apply as determined by the Engineer.

Review and comment on the Engineer's crack classification; however, the Engineer will make the final determination.

400-21.4 Nonstructural Cracking Significance: The Engineer will determine the Cracking Significance. The Cracking Significance will be determined on the basis of total crack surface area as a percentage of total concrete surface area. Cracking significance will be categorized as Isolated, Occasional, Moderate or Severe according to the criteria in Tables 1 and 2. Cracking Significance

will be determined on a LOT by LOT basis. A LOT will typically be made up of not more than 100 square feet and not less than 25 square feet of concrete surface area for structures other than bridge decks or typically not more than 400 square feet or not less than 100 square feet for bridge decks. A LOT will not extend beyond a single Elevation Range as shown in Table 1 or 2.

Review and comment on the Engineer's determination of Cracking Significance; however, the Engineer will make the final determination.

400-21.5 Repair Method: Repair or remove and replace cracked concrete as directed by the Engineer. Additional compensation or a time extension will not be approved for repair or removal and replacement of cracked concrete when the Engineer determines the cause to be the responsibility of the Contractor.

400-21.5.1 Nonstructural Cracks: Repair each crack using the method as determined by the Engineer for each LOT in accordance with Table 1 or 2. When further investigation is required to determine repair or rejection, either remove and replace the cracked concrete or submit a structural evaluation signed and sealed by the Contractor's Engineer of Record that includes recommended repair methods and a determination of structural capacity and durability to the Engineer. Upon approval by the Engineer, repair the cracked concrete. Upon approval by the Engineer use epoxy injection in accordance with Section 411 to repair cracks in a member inside a dry cofferdam prior to flooding of the cofferdam. "Reject and Replace" in Table 1 or 2 means there is no acceptable repair method.

400-21.5.2 Structural Cracks: Submit a structural evaluation signed and sealed by the Contractor's Engineer of Record that includes recommended repair methods and a determination of structural capacity and durability to the Engineer. Upon approval by the Engineer, repair the cracked concrete. Complete all repairs to cracks in a member inside a cofferdam prior to flooding the cofferdam.

Table 1
DISPOSITION OF CRACKED CONCRETE OTHER THAN BRIDGE DECKS
[see separate Key of Abbreviations and Footnotes for Tables 1 and 2]

Elev. Range	Crack Width Range (inch) [2] x = crack width	Cracking Significance Range per LOT [1]											
		Isolated Less than 0.005%			Occasional 0.005% to<0.017%			Moderate 0.017% to<0.029%			Severe 0.029% or gtr.		
		Environment Category											
		SA	MA	EA	SA	MA	EA	SA	MA	EA	SA	MA	EA
Elevation: 0 to 6 ft AMHW	$x \leq 0.004$	NT	NT	PS (6)	NT	PS (6)	PS (6)	PS (6)	PS (6)				
	$0.004 < x \leq 0.008$	NT	PS (6)	EI (3)	PS (6)	EI (3)	EI (3)	PS (6)					
	$0.008 < x \leq 0.012$	NT	PS (6)	EI									
	$0.012 < x \leq 0.016$	PS (6)	Investigate to Determine Appropriate Repair [4, 5] or Rejection										
	$0.016 < x \leq 0.020$												
	$0.020 < x \leq 0.024$									Reject and Replace			
	$0.024 < x \leq 0.028$												
	$x > 0.028$												
Elev.: More Than 6 ft to 12 ft AMHW	Crack Width	SA	MA	EA	SA	MA	EA	SA	MA	EA	SA	MA	EA
	$x \leq 0.004$	NT	NT	PS (6)	NT	PS (6)	PS (6)	PS (6)	PS (6)	PS (6)	PS (6)		
	$0.004 < x \leq 0.008$	NT	PS (6)	EI (3)	PS (6)	PS (6)	EI (3)	PS (6)	EI (3)				
	$0.008 < x \leq 0.012$	NT	PS (6)	EI	EI	EI							
	$0.012 < x \leq 0.016$	PS (6)	EI	EI	EI								
	$0.016 < x \leq 0.020$	EI											
	$0.020 < x \leq 0.024$		Investigate to Determine Appropriate Repair [4, 5] or Rejection							Reject and Replace			
	$0.024 < x \leq 0.028$												
	$x > 0.028$												
Elev.: Over Land or More Than	Crack Width	SA	MA	EA	SA	MA	EA	SA	MA	EA	SA	MA	EA
	$x \leq 0.004$	NT	NT	NT	NT	PS (6)	PS (6)	PS (6)	PS (6)	PS (6)	PS (6)		
	$0.004 < x \leq 0.008$	NT	PS (6)	PS (6)	PS (6)	PS (6)	EI (3)	PS (6)	EI (3)	EI (3)	PS (6)		

	$0.008 < x \leq 0.012$	NT	PS (6)	EI	EI	EI	EI	EI	EI				
	$0.012 < x \leq 0.016$	PS (6)	EI	EI	EI	EI	EI						
	$0.016 < x \leq 0.020$	EI	EI	EI	EI								
	$0.020 < x \leq 0.024$	EI	Investigate to Determine Appropriate Repair (4, 5) or Rejection										
	$0.024 < x \leq 0.028$										Reject and Replace		
	$x > 0.028$												

Table 2
DISPOSITION OF CRACKED CONCRETE BRIDGE DECKS
[see separate Key of Abbreviations and Footnotes for Tables 1 and 2]

Elev. Range	Crack Width Range (inch) [2]	Cracking Significance Range per LOT [1]											
		Isolated less than 0.005%			Occasional 0.005% to<0.017%			Moderate 0.017% to<0.029%			Severe 0.029% or gtr.		
		Environment Category											
	x = crack width	SA	MA	EA	SA	MA	EA	SA	MA	EA	SA	MA	EA
Elevation: 12 feet or Less AMHW	$x \leq 0.004$	NT	NT	NT	NT	NT	NT	NT	NT	NT			
	$0.004 < x \leq 0.008$	NT	NT	EI/M	NT	NT	EI/M	EI/M	EI/M	EI/M			
	$0.008 < x \leq 0.012$	NT	NT	EI/M	NT	EI/M	EI/M	EI/M	EI/M				
	$0.012 < x \leq 0.016$	NT	NT	EI/M	NT	EI/M							
	$0.016 < x \leq 0.020$	EI/M	EI/M	EI	EI								
	$0.020 < x \leq 0.024$	EI/M	EI	EI		Investigate to Determine Appropriate Repair [4, 5] or Rejection					Reject and Replace		
	$0.024 < x \leq 0.028$	EI/M	EI										
	$x > 0.028$												
Elevation: Over Land or More Than 12 feet AMHW	Crack Width	SA	MA	EA	SA	MA	EA	SA	MA	EA	SA	MA	EA
	$x \leq 0.004$	NT	NT	NT	NT	NT	NT	NT	NT	NT			
	$0.004 < x \leq 0.008$	NT	NT	NT	NT	NT	EI/M	NT	EI/M	EI/M			
	$0.008 < x \leq 0.012$	NT	NT	EI/M	NT	NT	EI/M	EI/M	EI/M				
	$0.012 < x \leq 0.016$	NT	NT	EI/M	NT	EI/M							
	$0.016 < x \leq 0.020$	NT	EI/M	EI	EI/M								
	$0.020 < x \leq 0.024$	NT	EI/M	EI		Investigate to Determine Appropriate Repair [4, 5] or Rejection					Reject and Replace		
	$0.024 < x \leq 0.028$	NT	EI/M										
	$x > 0.028$												

Key of Abbreviations and Footnotes for Tables 1 and 2		
Type Abbreviation	Abbreviation	Definition
Repair Method	EI	Epoxy Injection
	M	Methacrylate
	NT	No Treatment Required
	PS	Penetrant Sealer
Environment Category	EA	Extremely Aggressive
	MA	Moderately Aggressive
	SA	Slightly Aggressive
Reference Elevation	AMHW	Above Mean High Water

Footnotes

(1) Cracking Significance Range is determined by computing the ratio of Total Cracked Surface Area (TCSA) to Total Surface Area (TSA) per LOT in percent [(TCSA/TSA) x 100] then by identifying the Cracking Significance Range in which that value falls. TCSA is the sum of the surface areas of the individual cracks in the LOT. The surface area of an individual crack is determined by taking width measurements of the crack at 3 representative locations and then computing their average which is then multiplied by the crack length.

(2) Crack Width Range is determined by computing the width of an individual crack as computed in (1) above and then identifying the range in which that individual crack width falls.

(3) When the Engineer determines that a crack in the 0.004 inch to 0.008 inch width range cannot be injected then for Table 1 use penetrant sealer unless the surface is horizontal, in which case, use methacrylate if the manufacturer's recommendations allow it to be used and if it can be applied effectively as determined by the Engineer.

(4) (a) Perform epoxy injection of cracks in accordance with Section 411. Seal cracks with penetrant sealer or methacrylate as per Section 413. (b) Use only methacrylate or penetrant sealer that is compatible, according to manufacturer's recommendations, with previously applied materials such as curing compound or paint or remove such materials prior to application.

(5) When possible, prior to final acceptance of the project, seal cracks only after it has been determined that no additional growth will occur.

(6) Methacrylate shall be used on horizontal surfaces in lieu of penetrant sealer if the manufacturer's recommendations allow it to be used and if it can be applied effectively as determined by the Engineer.

(7) Unless directed otherwise by the Engineer, repair cracks in bridge decks only after the grinding and grooving required by 400-

400-22 Method of Measurement.

400-22.1 General: The quantities of concrete to be paid for will be the volume, in cubic yards, of each of the various classes shown in the Plans, in place, completed and accepted. The quantity of precast anchor beams to be paid for will be the number in place and accepted. The quantity of bridge deck grooving to be paid for will be the area, in square yards of bridge deck and approach slab, completed and accepted. The quantity of bridge deck grooving and planing to be paid for will be the area, in square yards of bridge deck and approach slab, completed and accepted.

Except for precast anchor beams, for any item of work constructed under this Section and for which measurement for payment is not to be made by the volume of concrete, measurement and payment for such work will be as specified in the Section under which the work is specified in detail.

No separate payment will be made for obtaining the required concrete finish.

400-22.2 Calculation of Volume of Concrete:

400-22.2.1 Dimensions: The quantity will be computed by the plan dimensions of the concrete, within the neat lines shown in the Plans, except that no deduction will be made for weep

holes, deck drains, or encroachment of inlets and pipes in box culverts, and no chamfers, scorings, fillets, or radii 1 1/2 in^2 or less in cross-sectional area will be taken into account.

400-22.2.2 Pay Quantity: The quantity to be paid for will be the original plan quantity, measured as provided in 400-22.2.1, except that where the Plans call for an estimated quantity of miscellaneous concrete for contingent use, the contingent concrete will be measured as the actual quantity in place and accepted.

400-22.2.3 Items not Included in Measurement for Payment: No measurements or other allowances will be made for work or material for forms, falsework, cofferdams, pumping, bracing, expansion-joint material, etc. The volume of all materials embedded in the concrete, such as structural steel, pile heads, etc., except reinforcing bars or mesh, will be deducted when computing the volume of concrete to be paid for. For each foot of timber pile embedded, 0.8 cubic feet of concrete will be deducted. The cost of furnishing and placing dowel bars shall be included in the Contract unit price for the concrete.

400-22.2.4 Deck Girders and Beam Spans: In computing the volume of concrete in deck girders and beam spans, the thickness of the slab will be taken as the nominal thickness shown on the drawings and the width will be taken as the horizontal distance measured across the roadway. The volume of haunches over beams will be included in the volume to be paid for.

400-22.2.5 Stay-in-Place Metal Forms: When using stay-in-place metal forms to form the slab of deck girder and beam spans, the volume of concrete will be computed in accordance with the provisions of 400-22.2.4 except that the thickness of the slab over the projected plan area of the stay-in-place metal forms will be taken as the thickness shown on the drawings above the top surface of the forms. The concrete required to fill the form flutes will not be included in the volume of concrete thus computed.

400-22.3 Bridge Deck Grooving: The quantity to be paid for will be plan quantity in square yards, computed, using the area bound by the gutter lines (at barrier rails, curbs and median dividers) and the beginning and end of the bridge or the end of approach slabs, whichever is applicable, constructed, in place and accepted.

400-22.4 Bridge Deck Grooving and Planing: The quantity to be paid for will be plan quantity in square yards, computed, using the area bound by the gutter lines (at barrier rails, curbs and median dividers) and the beginning and end of the bridge or the end of approach slabs, whichever is applicable, constructed, in place and accepted.

400-22.5 Composite Neoprene Pads: The quantity to be paid for will be the original plan quantity, computed using the dimensions of the pads shown in the Plans.

400-22.6 Cleaning and Coating Concrete Surfaces: The quantity to be paid for will be the plan quantity in square feet for the areas shown in the Plans.

400-23 Basis of Payment.

400-23.1 Concrete:

400-23.1.1 General: Price and payment will be full compensation for each of the various classes of concrete shown in the proposal.

400-23.1.2 Concrete Placed below Plan Depth: Authorized concrete placed in seal or footings 5 feet or less below the elevation of bottom of seal or footing as shown in the Plans will be paid for at the Contract price set forth in the proposal under the pay items for substructure concrete.

Authorized concrete used in seal (or in the substructure where no seal is used) at a depth greater than 5 feet below the bottom of seal or footing as shown in the Plans will be paid for as Unforeseeable Work.

Such payment will be full compensation for the cofferdam construction, for excavation, and for all other expenses caused by the lowering of the footings.

400-23.1.3 Seal Concrete Required but Not Shown in Plans: When seal concrete is required as provided in 400-8 and there is no seal concrete shown in the Plans, it will be paid for as Unforeseeable Work.

400-23.2 Precast Anchor Beams: Price and payment will be full compensation for the beams, including all reinforcing and materials necessary to complete the beams in place and accepted.

No separate prices will be allowed for the various types of anchor beams.

400-23.3 Reinforcing: Reinforcing bars, wires and mesh will be measured and paid for as provided in Section 415, except that no separate payment will be made for the welded wire reinforcement used in concrete jackets on steel piles or reinforcement contained in traffic railings, barriers, traffic separators or parapets. Where so indicated in the Plans, the City will not separately pay for reinforcing used in incidental concrete work, but the cost of such reinforcement shall be included in the Contract unit price for the concrete.

400-23.4 Bridge Deck Grooving: Price and payment will be full compensation for all grinding, grooving, equipment, labor, and material required to complete the work in an acceptable manner.

400-23.5 Bridge Deck Grooving and Planing: Price and payment will be full compensation for all grooving, planing, equipment, labor, and material required to complete the work in an acceptable manner.

400-23.6 Composite Neoprene Pads: Price and payment will be full compensation for all work and materials required to complete installation of the pads.

400-23.7 Cleaning and Coating Concrete Surfaces: Price and payment will be full compensation for all work and materials required. The cost of coating new concrete will not be paid for separately, but will be included in the cost of the item to which it is applied.

400-23.8 General: The above prices and payments will be full compensation for all work specified in this Section, including all forms, falsework, joints, weep holes, drains, pipes, conduits, bearing pads, setting anchor bolts and dowels, surface finish, and cleaning up, as shown in the Plans or as directed. Where the Plans call for water stops, include the cost of the water stops in the Contract unit price for the concrete.

Unless payment is provided under a separate item in the proposal, the above prices and payments will also include all clearing and grubbing; removal of existing structures; excavation, as provided in Section 125; and expansion joint angles and bolts.

The City will not change the rate of payment for the various classes of concrete in which steel or FRP may be used due to the addition or reduction of reinforcing.

The City will not make an allowance for cofferdams, pumping, bracing, or other materials or equipment not becoming a part of the finished structure. The City will not pay for concrete placed outside the neat lines as shown in the Plans.

When using stay-in-place metal forms to form bridge decks, the forms, concrete required to fill the form flutes, attachments, supports, shoring, accessories, and all miscellaneous

items or work required to install the forms shall be included in the Contract unit price of the superstructure concrete.

400-23.9 Payment Items:

Payment will be made under:

Item No. 400- 0-	Class NS Concrete – per cubic yard.
Item No. 400- 1-	Class I Concrete - per cubic yard.
Item No. 400- 2-	Class II Concrete - per cubic yard.
Item No. 400- 3-	Class III Concrete - per cubic yard.
Item No. 400- 4-	Class IV Concrete - per cubic yard.
Item No. 400- 6-	Precast Anchor Beams - each.
Item No. 400- 7-	Bridge Deck Grooving - per square yard.
Item No. 400- 9-	Bridge Deck Grooving and Planing - per square yard.
Item No. 400-143-	Cleaning and Coating Concrete Surfaces - per square foot.
Item No. 400-147-	Composite Neoprene Pads - per cubic foot.

SECTION 415 - REINFORCING FOR CONCRETE

415-1 Description.

Furnish and place steel and fiber reinforced polymer (FRP) reinforcing of the quality, type, size, and quantity designated. Obtain all FRP reinforcing bars from a producer on the City's Production Facility Listing.

415-2 Materials.

Meet the following requirements:

Steel Bar Reinforcement 931-1.1
Steel Welded Wire Reinforcement 931-1.2
FRP Bar Reinforcement 932-3

415-3 Protection of Material.

415-3.1 Steel Reinforcing: Store steel reinforcement above the surface of the ground, upon platforms, skids, or other supports, and protect it from mechanical injury and surface deterioration. Ensure that the steel reinforcement is free from loose rust, scale, dirt, paint, oil, and other foreign material prior to incorporation into the work.

415-3.2 Fiber Reinforcing Polymer (FRP) Reinforcing: Store FRP reinforcement above the surface of the ground, in boxes or upon platforms, skids, or other supports, and protect it from mechanical injury and direct exposure to UV light. Ensure that the FRP reinforcement is free from dirt, paint, oil, and other foreign material prior to incorporation into the work.

415-4 Bending, Splicing, and Cutting.

415-4.1 Steel Reinforcing: Fabricate reinforcing bars as prescribed in the CRSI Manual of Standard Practice. Shop bend the reinforcement cold to the shapes indicated in the Plans. Do not bend the reinforcement to shape in the field. Minor bending adjustments may be performed in the field with the approval of the Engineer.

Do not hot bend or straighten, weld, or thermal cut reinforcing steel.

415-4.2 Fiber Reinforcing Polymer (FRP) Reinforcing: No field fabrication of FRP reinforcing bars is permitted except tying and field cutting per ACI 440.5. Do not bend or straighten, couple, thermal cut, or shear cut FRP reinforcing bars.

415-5 Placing and Fastening.

415-5.1 General: Unless otherwise specified in the Contract Documents, the tolerance for bar spacing is plus or minus 1 inch from the plan position and the tolerance for concrete cover is minus 1/4 inch or plus 1/2 inch from the plan dimensions. Construct all tie patterns referenced by this Section in accordance with the CRSI Manual of Standard Practice.

415-5.2 Concrete Blocks for Spacing: Use precast concrete blocks to space and support the reinforcing bars. Use concrete blocks with a strength equal to or greater than the concrete in which they are to be placed and have wires cast into them for fastening to the reinforcing bars. Moist-cure the blocks for at least three days.

Submit a certification verifying the class of concrete used to fabricate the concrete blocks, and identifying the batch and load of concrete from which the concrete blocks were cast.

415-5.3 Tying:

415-5.3.1 Steel Reinforcing: Tie steel reinforcing using pliable steel wire that readily bends and twists without breaking and that provides a tie of sufficient strength to hold the steel reinforcing in its proper position. Tie stainless reinforcing steel using plastic, polymer, or nylon coated pliable steel wire; or stainless steel wire meeting the requirements of ASTM A276, UNS S31600.

415-5.3.2 Fiber Reinforcing Polymer (FRP) Reinforcing: Tie FRP reinforcing using plastic, polymer, or nylon coated pliable steel wire that readily bends and twists without breaking and that provides a tie of sufficient strength to hold the FRP reinforcing in its proper position.

415-5.4 Splices: Where splices are authorized, rigidly clamp the bars or tie them in a manner meeting the Engineer's approval. Use the lap splice length as shown on the Plans.

415-5.4.1 Steel Reinforcing: Do not use welded splices for steel reinforcing except as specifically authorized by the Engineer and meeting the requirements of AWS D 1.4 Structural Welding Code - Reinforcing Steel.

Use mechanical couplers or splice devices for steel reinforcing that are listed on the City's Approved Product List (APL).

415-5.4.2 Fiber Reinforcing Polymer (FRP) Reinforcing: Do not use mechanical couplers for FRP reinforcing. Use lap splices only.

415-5.5 Footings:

415-5.5.1 Supports: Support footing mat reinforcing with concrete blocks having dimensions not greater than 4 by 4 inches by plan clearance. Fasten concrete blocks to the steel using the cast-in wires.

415-5.5.2 Tolerances: Place footing mat reinforcing within 1/2 inch vertically from the plan bottom clearance and within 1 inch from the plan side clearance.

415-5.5.3 Tying: Tie footing mat reinforcing with a double-strand single tie at all intersections on the periphery and at alternate intersections within the mat.

415-5.6 Dowel Bars for Columns and Walls:

415-5.6.1 Supports and Positioning: Position dowel bars projecting into columns and walls so as to allow splicing of the vertical bars to the dowels and to tie the dowel bars in their plan position. Support the dowel bars by a rigid template such that concrete placement does not disturb their position. Support the reinforcing prior to placement of the footing concrete and do not insert dowel bars into the plastic concrete.

415-5.6.2 Tolerances: Place the dowels within 1/2 inch of their plan position and with a side clearance tolerance not exceeding 1/4 inch.

415-5.7 Verticals and Hoops for Columns:

415-5.7.1 Spacing-off from Side Forms: Space column reinforcing bars from the side forms by concrete blocks of dimensions not exceeding 2 inches by 2 inches by clearance dimension. Securely fasten each block to the reinforcing.

415-5.7.2 Tolerances and Clearance:

1. Column Verticals: Place column verticals within 1/2 inch of their plan position. Ensure that the side form clearance is within 1/4 inch of the specified clearance.

2. Column Hoops: Place every hoop within 1 inch of the plan position for the specific hoop, with no accumulation of such tolerance caused by the spacing between any two hoops. Ensure that side form clearance for any hoop is within 1/2 inch of its specified clearance.

415-5.7.3 Tying: Tie the column hoops to the column verticals at each intersection, by a cross tie or figure 8 tie.

415-5.8 Wall Reinforcing (Not Including Dowel Bars):

415-5.8.1 Supports: Space wall reinforcing bars from the side forms by concrete blocks of dimensions not greater than 2 inches by 2 inches by clearance dimensions. Fix the spacing between wall mats by means satisfactory to the Engineer.

415-5.8.2 Tolerance: Except when necessary to clear a fixture, place reinforcing bars within 1 inch of plan position. Ensure that the number of bars in any affected unit is as specified, and place the remainder of the bars (not thus affected) within 1 inch of plan location.

415-5.8.3 Tying: Tie retaining wall reinforcing bars with a cross tie or figure 8 tie at each intersection on the periphery and at every third intersection within the mat. If workmen use the reinforcing as a ladder, provide additional ties as directed by the Engineer.

Tie noise and perimeter wall reinforcing bars with a single tie at each intersection on the periphery and at every third intersection within the mat.

415-5.9 Beams and Caps:

415-5.9.1 Supports: Maintain bottom clearances by approved heavy beam bolsters. Support additional layers of main longitudinal reinforcing bars from the lower layers by heavy upper-beam bolsters, placed directly over low supports.

Begin the spacing of beam bolsters at not more than 2 feet from the end of the beams or caps and space the additionally required bolsters at not more than 4 feet.

Use concrete blocks, having dimensions not greater than 2 inches by 2 inches by specified clearance, fastened to the reinforcing bars by the cast-in wires, for spacing the upper main longitudinal bars below the top bars. Maintain the side clearance by concrete blocks, having dimensions not greater than 2 inches by 2 inches by required clearance, fastened to the reinforcing bars by the cast-in wires.

415-5.9.2 Tolerances: Place the main longitudinal reinforcing bars so as to provide a bottom and top clearance within 1/4 inch of the plan vertical dimensions for all layers. Space the bars from side forms within 1/2 inch of the specified spacing.

Place stirrups within 1 inch of the plan position for each individual stirrup and do not allow the tolerance to accumulate.

415-5.9.3 Tying: Tie all intersecting bars with a double-strand single tie.

415-5.10 Deck Slabs:

415-5.10.1 Supports:

1. Bottom Mats: Support the bottom mat of reinforcing bars using slab bolsters or concrete blocks. Use one row of slab bolsters placed 6 inches from the edge of the slab and two rows down each deck section between beams. Do not allow the spacing between rows to exceed 4 feet, measured center to center.

Use concrete blocks 2 inches by 2 inches by clearance dimensions. Space concrete blocks 4 feet on center as a maximum.

2. Top Mats: Support the top mats of reinforcing bars by either continuous or individual high chairs. Provide high chairs along both sides of each beam and approximately 6 inches back from the edge of the beam. Place the outside row of high chairs 6 inches from the edge of the slab. If using individual high chairs, do not allow the longitudinal spacing to be greater than 4 feet.

As an alternate to the above, on prestressed beam construction, the Contractor may support the top mat of reinforcing bars on the shear connectors bent to the proper elevation with one line of high chairs centered between the beams.

3. Truss Bars: Support truss bars at each end of the top bends by continuous high chairs or by individual high chairs spaced longitudinally at not more than 4 feet.

415-5.10.2 Tolerances: Ensure that top and bottom clearances are within 1/4 inch from those shown in the Plans.

Ensure that end and bottom clearances are within 1/4 inch from those shown in the Plans.

Ensure that end and edge clearances are within 1/4 inch of the clearance specified.

Place curb bars within 1/4 inch in any direction of the plan position.

415-5.10.3 Tying: Tie all reinforcing bars in each layer with a double-strand single tie at every intersection on the periphery and at every third intersection in the interior area. If encountering difficulty in maintaining the reinforcing bars in position during the placing of concrete, tie additional intersections as necessary to hold the reinforcing bars secure.

415-5.11 Box Culverts:

415-5.11.1 Supports:

1. Bottom Slabs: In the bottom slabs of box culverts, provide supports for single-mat reinforcing bars and for bottom-mat reinforcing bars, including placement and spacing, as specified for footing mat steel in 415-5.5. In addition, where the Plans call for more than one mat of reinforcing bars in the bottom slab of the culvert, support the top mat away from the bottom mat, either by upper beam bolsters or by other means satisfactory to the Engineer.

2. Walls: Place, space and support the reinforcing bars in walls of box culverts in accordance with the requirements of 415-5.8.

3. Top Slabs: In the top slabs of box culverts, support the bottom mats of reinforcing bars by a row of slab bolsters 12 inches from the inside face of the walls and with additional rows of bolsters at spacings not exceeding 4 feet, center to center. As an exception, unless the Engineer deems the use of the slab bolsters as necessary to obtain proper support, the Contractor may use concrete blocks as the supporting device. Use blocks of dimensions not greater than 2 inches by 2 inches by the required clearance, with spacings not exceeding 4 feet in any direction. Fasten blocks to the reinforcing steel by the cast-in wires.

4. Truss Bars: Support truss bars as specified in 415-5.10..

415-5.11.2 Tolerances: Use tolerances in placing the reinforcing bars in box culvert slabs as specified for deck slabs in 415-5.10. Use tolerances for placing bars in walls as specified in 415-5.8.

415-5.11.3 Tying: Tie reinforcing bars in box culverts as specified for deck slabs in 415-5.10.

415-5.12 Cleaning: Before placing any concrete, clean all mortar from the reinforcement.

415-5.13 Bar Supports:

415-5.13.1 General: Provide reinforcing bar supports manufactured in accordance with all requirements of the CRSI Manual of Standard Practice. Use bar supports of adequate strength to withstand a 300 pound concentrated load without permanent deformation or breakage, with deflection less than 5% of the support height.

Ensure that no more than 5% of the reinforcing bar supports exhibit unsatisfactory performance, breakage, or permanent deformation during bar tying and/or concrete placement operations. If a bar support does not achieve this level of performance, reduce the average spacing between bar supports by 15%, or remove that product from use on the job.

Ensure that bar supports do not move during concrete placing operations. To prevent movement, tie supports to the reinforcing bars.

When using bar supports on corrugated metal stay-in-place forms, use supports specifically designed for the form being used.

For structural elements located in extremely aggressive environments, do not use metal bar supports in contact with removable forms or floor surfaces to support reinforcing bars.

415-5.13.2 Metal Bar Supports: For metal bar supports in contact with removable forms, provide supports constructed with molded plastic legs or plastic protected metal legs or bolster rails. Do not allow any portion of the bar support other than the molded plastic leg or plastic protected portion of the metal leg or bolster rail to be closer than 1/2 inch from the removable form surface for concrete to be cast.

Submit certification verifying that all metal bar supports meet the following requirements:

1. That they are manufactured from cold drawn steel wire in accordance with the wire sizes and geometrical dimensions shown in the CRSI Manual of Standard Practice, Chapter 3.

2. That the plastic used for protection of the steel legs or bolster rails has a thickness of 3/32 inch or greater at points of contact with the form work.

Provide plastic protection by a dipping operation, by adding premolded plastic tips to the legs of the support or by molding plastic to the top wire of the support. Ensure that the plastic material used for protection of steel legs does not chip, crack, deform, or peel during use.

Do not use metal bar supports to support FRP reinforcing bars.

415-5.13.3 Plastic Bar Supports and Spacers: Use non-stackable plastic bar supports and spacers. Bar supports shall be able to meet the concentrated load requirements of 415-5.13 within a working temperature range of 20 to 150°F. Spacers shall be able to provide sufficient strength to support reinforcing steel in the required position without deformation and relaxation under job conditions. For drilled shafts, use wheel spacers with a smooth perimeter surface.

Submit protection from sunlight until placed in the form and mold in a configuration which does not restrict concrete flow and consolidation.

All plastic bar supports and spacers shall have a maximum water absorption of 0.5% at 7 days as per ASTM D570. Plastic bar supports and spacers made of recycled plastic products must meet the additional requirements of Section 972.

Submit to the Engineer independent lab test data and certification verifying that the plastic spacers meet the requirements specified herein.

Use plastic bar supports listed on the City's APL. Provide each individual bar support with an identification number unique to the particular model permanently marked on the surface as included in the APL. Manufacturers seeking evaluation of products for inclusion on the APL must submit an application in accordance with Section 6 and include certified test reports from an independent laboratory showing that the plastic bar supports meet all the requirements specified herein.

415-6 Welded Deformed Steel Wire Reinforcement.

415-6.1 General: Provide welded deformed steel wire reinforcement as shown in the Plans or as a substitute for deformed bar reinforcement when approved on the shop drawings. Propose substitutions of welded deformed steel wire reinforcement in a manner that provides a cross-sectional area per foot of welded deformed steel wire equal to that provided in the Plans for

deformed bar reinforcement. Orient the deformed wires of welded deformed steel wire reinforcement in the same position as bar reinforcement detailed in the Plans. Cross wires of welded deformed steel wire reinforcement may be deformed or smooth and must have a cross- sectional area at least 35% greater than the area of the deformed wire.

415-6.2 Design: When welded deformed steel wire reinforcement is substituted for deformed bar reinforcement, ensure that the development length, splices, shear reinforcement, and distribution meet the requirements of the AASHTO LRFD Bridge Design Specifications.

415-7 Method of Measurement.

415-7.1 Reinforcing Steel: The quantity to be paid for will be the plan quantity, in pounds, of reinforcing steel, stainless reinforcing steel, or low carbon chromium reinforcing steel incorporated into the completed work and accepted, subject to any changes approved by the Engineer. The quantity will not include the reinforcing steel (all types) in any item of work for which the basis of payment already includes the steel reinforcement. No additional payment will be made for substitutions of welded deformed wire reinforcement proposed by the Contractor. No separate payment will be made for reinforcing steel (all types) in pipe endwalls. No deduction will be made from reinforcing steel (all types) quantities for encroachment of inlets and pipes in box culverts. The lengths to be used in the calculation will be the detailed lengths of bars as shown in the Plans.

415-7.2 Unit Weights of Steel Bars: The unit weights used will be CRSI Standard Reinforcing Steel Bar Weights.

415-7.3 Welded Wire Reinforcement: Where welded wire reinforcement is to be paid for by weight, the quantity to be paid for will be the product of the area, in square feet, of the welded wire reinforcement incorporated into the completed work and accepted, multiplied by the manufacturer's standard weight per square foot.

When welded deformed steel wire reinforcement is substituted for deformed bar reinforcement, the quantity to be paid for will be the quantity which would be paid for if bar reinforcement as detailed in the Plans were utilized, based on plan quantity.

415-7.4 Fiber Reinforcing Polymer (FRP) Reinforcing: The quantity to be paid for will be the plan quantity, in linear feet, of bar incorporated into the completed work and accepted, subject to any changes approved by the Engineer. The quantity will not include the FRP bar in any item of work for which the basis of payment already includes the FRP bars. The lengths to be used in the calculation will be the detailed lengths of bars as shown in the Plans.

415-8 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including all welding, all clips, spacers, ties, mechanical couplers, etc., and wire or other material used for fastening the reinforcement in place.

If spliced bars are used when full length bars might reasonably be required, the weight paid for will be only that which would be obtained if full length bars were used, with no allowance for lap.

Payment will be made under:

Item No. 415- 1-	Reinforcing Steel - per pound.
Item No. 415- 2-	Stainless Reinforcing Steel – per pound.
Item No. 415- 3-	Low Carbon Chromium Reinforcing Steel – per pound.
Item No. 415- 10-	Fiber Reinforced Polymer Reinforcing Bar – per linear foot.

SECTION 450 - PRECAST PRESTRESSED CONCRETE CONSTRUCTION

450-1 Description.

Fabricate, store, transport and erect precast/prestressed concrete members prestressed by the pretensioning method. Pretensioned precast prestressed concrete products are products prestressed by the pretensioning method. In this method, steel or fiber reinforced polymer (FRP) components are stressed and anchored; the concrete for the product is then cast and cured, and finally the stress in the steel or FRP components is released from the anchorages to the concrete through bond, after the concrete has attained its specified release strength.

A precast prestressed concrete plant, hereinafter called plant, is an independent operating facility capable of performing all the operations necessary to fabricate precast/prestressed concrete products.

Obtain precast/prestressed products from a plant that is currently on the City's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

When the Producer's Quality Control Program is suspended, accept responsibility of either obtaining precast/prestressed products from a precast/prestressed concrete plant with an accepted Quality Control Program, or await re-approval of the Producer Quality Control Program. The Engineer will not allow changes in Contract Time or completion dates as a result of the concrete plant's Quality Control Program suspension. Accept responsibility for all delay costs or other costs associated with the plant's Quality Control Program suspension.

450-2 Quality Control Program.

450-2.1 General: Develop a Producer Quality Control Program as specified in Section 105.

Meet the requirements of the accepted Quality Control Program, Contract Documents, and Precast/Prestressed Concrete Institute (PCI) Manual for Quality Control for plants and production of structural precast concrete products. The requirements of the Contract Documents will govern, when there is a discrepancy between the PCI Manual and the Contract Documents.

Accept responsibility for performing daily Quality Control (QC) inspections of all phases of work ensuring all materials and workmanship incorporated into the product meet the requirements of the Contract Documents. Also, maintain a daily activity report detailing the results of the daily Quality Control Program activities. Ensure these daily reports and minutes of the weekly meetings with the Engineer and the plant's production personnel are maintained at the plant. During the weekly meetings, discuss the results of the QC inspections.

Inspect the product for conformance with the product dimension tolerances shown in Appendix B of PCI Manual MNL-116 (Manual for Quality Control for Plants and Production of Structural Precast Concrete Products), except as modified herein. Apply the tolerances with respect to the theoretical positions and dimensions shown in the Plans. Apply the same tolerances for U-Beams as those specified for I-girders, excluding sweep tolerance, when inspecting the product for conformance with dimension tolerances. For Florida U-Beam diaphragms, the tolerance for the thickness of the intermediate and end diaphragms is plus 1 inch and minus 1/2 inch, and the location of intermediate diaphragms, relative to design plan positions, is plus or minus 3 inches. The tolerance of the thickness of end diaphragms shall be plus 3 inches and minus 1/2 inch.

Limit sweep to 1/2 inch for U-Beams and Inverted-T Beams. The tolerance for beam strand sheathing is plus or minus 2 inches.

Ensure the tolerance on all miscellaneous shaping including, but not limited to, chamfers, miters, bevels, keys, tapers, radii, holes, inserts, and block outs is within plus or minus 1/8 inch of the control dimension of the shape.

The tolerances represent the total allowable tolerance that will be accepted in the finished product. Do not apply tolerances shown for the overall dimensions of a member to violate the tolerances shown for positions of reinforcing and prestressing steel or FRP. Apply the tolerances during and after the fabrication of prestressed products. Do not reduce the concrete cover for reinforcing steel, FRP reinforcing, prestressing steel, FRP prestressing strands, or any other metallic objects specified in the Plans more than 1/4 inch. Do not reduce the concrete cover for reinforcing steel, FRP reinforcing, prestressing steel, FRP prestressing strands, or any other metallic or plastic objects when the cover specified in the Plans is minimum cover.

Ensure the QC inspector is present during concrete placements and performs inspection during all fabrication of precast prestressed concrete products, including the inspection of the operations before, during and after the placement of concrete.

Ensure the Plant QC Manager, or the QC inspectors under their direction, examine all precast prestressed concrete products within five working days of detensioning to ensure their dimensions conform to the specified tolerances and to determine if there are any deficiencies. This process control shall be listed on the Producer Quality Control Plan (QC Plan).

450-2.2 Plant: Ensure each plant has an onsite QC Manager meeting the requirements of Section 105.

450-2.3 Product Certification: Ensure the QC inspector inspects all completed products at the plant not less than 24 hours before shipment to verify that all Contract Documents requirements are met. Upon verification that all Contract Document requirements have been met and all necessary repairs have been satisfactorily completed, the product will be stamped with the approved QC Manager stamp identified in the Producer QC Plan.

With each monthly request submitted for payment, attach a certification stating that the listed precast prestressed products have been produced under the Producer QC Plan and meet the Contract Document requirements. Ensure the certification is signed by a legally responsible person of the plant and is submitted on the plant's letterhead.

450-2.4 Documentation: Ensure that a system of records is maintained in each plant which will provide all information regarding the certification and testing of prestressing steel, FRP prestressing strands, reinforcing steel, FRP reinforcing, concrete materials and concrete, curing materials, embedded items, tensioning, concrete proportioning, pre-placement, placement, post-placement inspections, curing, and disposition of products. Include in the record keeping the deficiencies found as a result of the inspection and testing. Keep certified test reports for all materials incorporated into the production of precast prestressed concrete products.

Ensure that the record of tensioning operations is maintained and reflects the identification of the bed, type of fabricated products, the complete Financial Project Identification Number, jack identification number, date prestressing strands were stressed, temperature at the time of stressing, and signature of the qualified tensioning machine operator.

Ensure the proposed method and format for documenting required information is included in the Producer QC Plan.

Maintain records until all the precast prestressed products for a project have been fabricated then submit all the records to the Engineer. Ensure records are available at all times for the Engineer's inspection.

450-2.5 Quality Assurance Inspection and Testing: The Engineer will perform periodic inspections, sampling, and testing to ensure of the quality and acceptability of the materials, methods, techniques, procedures and processes being utilized by the Contractor in the fabrication of precast prestressed concrete products.

450-3 Materials.

450-3.1 General: Meet the following requirements:

Concrete .....Section 346
Steel Strands*.....Section 933
Carbon Fiber Reinforcing Polymer (CFRP)
Strands*.....Section 933
Steel Prestressing Bars.....Section 933
Steel Accessories .....Section 933
Steel Spirals .....Section 931
Reinforcing Steel and Metal Welded Wire
Reinforcement..... Sections 415 and 931
FRP Reinforcing ..... Sections 415 and 932
FRP Spirals** .....Section 932
Embedded Ducts .....Section 960
Membrane Curing compounds***.....Section 925
Epoxy Resin Compounds.....Section 926
Burlap.....Section 925
Curing Blanket 400-16
Penetrant sealer*** .....Section 413
Methacrylate .....Section 413
Epoxy Injection of Cracks .....Section 411

* Do not use strands from more than one source in any individual prestressed element, with the exception of the partially tensioned strands (dormant strands).

** The FRP spirals cannot be used in combination with steel prestressing strand..

*** Use membrane curing compounds and sealers that are compatible with coating or other materials that are applied to concrete surface.

Use inserts in accordance with the recommendations of the manufacturers and within their certified capacities and application qualifications. Do not use aluminum inserts.

Use draped strand devices of sufficient rigidity having adequate support to retain the position of the strand unchanged under the induced load. Do not allow the devices to induce friction to the tendons such that the required jacking force and elongation cannot be attained.

450-3.2 Strand Chucks and Splice Chucks: For pretensioning, use strand chucks that are capable of anchoring the strands without slippage after seating and ensure against strand failure within the grips at loads less than 95% of ultimate strength.

Submit manufacturer's certification that splice chucks used to transmit the prestressing force from one prestressing tendon to another are capable to hold at least 95% of the ultimate tensile strength of the prestressing strand.

Do not use wedges that become worn, cracked, deformed, or that allow dead end seating in excess of 3/8 inch. Use components from the same manufacturer to make up chucks and to provide proper wedge fit.

Use chucks as complete units. Clean, inspect, and lubricate the chucks between each use. Use wedges and housing that are compatible and made for the specific type and size of prestressing strand that are being used, avoid improper fit and improper seating of wedges on the strands.

The Engineer will allow one splice per strand subject to the following:

1. Splices are located outside the concrete products (except for precast piling where up to two splices are permitted to be used in each pile, so long as they are not located in the same vertical cross section, perpendicular to longitudinal axis of the pile).

2. Strands which are being spliced have the "lay" or "twist" in the same direction.

450-4 Material Acceptance and Testing.

450-4.1 Concrete: Perform the QC sampling and testing of concrete in accordance with the requirements of Section 346.

450-4.2 Reinforcing ,Welded Wire Reinforcement and Prestressing Steel for Pretensioning:

450-4.2.1 General: Identify all reinforcing steel, welded wire reinforcement and prestressing strand for pretensioning by LOTs. A LOT of reinforcing steel or welded wire is a shipment of material from the same manufacturer and heat. A LOT of prestressing steel is a shipment of material of the same size, production grade and heat from the same manufacturer. A LOT of FRP reinforcing bars or prestressing strands is a shipment of material of the same size, fiber lot and resin batch from the same manufacturer.

Acceptance of reinforcing bars, welded wire reinforcement and prestressing steel for pretensioning is based on manufacturer's certification and the City's verification tests. The sampling for verification testing will be performed by the City at each precast plant, on at least two LOTs per year, additional samples may be taken at the manufacturing source of reinforcing bars, welded wire reinforcement and prestressing strands.

When products contain the material that has failed to meet the requirements of 450-3, reject the unused material of the failed LOT. The Engineer may require the evaluation of the products, which contain the failed material, in accordance with 450-14.

450-4.2.2 Steel Reinforcing and Welded Wire Reinforcement: Obtain and maintain for each LOT a certified mill analysis, physical property test report and the manufacturer's assigned LOT number with the heat of the material represented. Verify that the report represents the steel received and that the steel meets the Contract Documents requirements. Reject all unidentified reinforcing steel or welded wire reinforcement received at the plant or job site.

Submit the manufacturer's certified mill analysis and provide three 7 foot long, randomly selected samples from the designated LOT of reinforcing steel and three randomly selected samples from the designated LOT of welded wire reinforcement when requested by Engineer. Ensure each sample of welded wire reinforcement covers an area of four intersections of transverse and

longitudinal bars. Ensure the transverse wires of each piece of welded wire reinforcement extend approximately 6 inches to both sides.

450-4.2.3 Fiber Reinforced Polymer (FRP) Reinforcing: Meet the requirements of 932-3.

450-4.2.4 Steel Prestressing Strand for Pretensioning: Obtain and maintain for each LOT of material received, the manufacturer's assigned LOT number, certified test values for specified material properties together with a representative load-elongation curve and the modulus of elasticity value based upon strand nominal area. Submit and support by records maintained by the strand manufacturer, production tolerances applied in selection of the reported strand modulus. Verify that documents submitted represent the shipment received and meets the Contract Documents requirements.

Reject all unidentified prestressing steel received at the plant or job site.

Submit the manufacturer's certified mill analysis and provide three 5 foot long randomly selected samples from the designated LOT of material when requested by the Engineer.

450-4.2.5 Fiber Reinforced Polymer (FRP) Prestressing Strand for Pretensioning: Meet the requirements of 933-5.2.2.

450-4.2.6 Strand Chucks and Splice Chucks: Obtain and maintain certified test results certifying that the material meets the requirements of 450-3.

450-4.2.7 Steel Accessories: Use only steel accessories meeting the requirements of 450-3.

450-4.2.8 Ducts: Obtain and maintain certified test results certifying that the material meets the requirements of 450-3.

450-5 Shop Drawings.

Submit shop drawings for all pretensioned prestressed concrete products containing FRP bars or strands. Submit shop drawings for all other pretensioned prestressed concrete products when the Contract Documents do not contain all the detailed information necessary to fabricate and erect the pretensioned prestressed concrete product. Ensure the submitted shop drawings meet the requirements of 5-1 and any additional Contract Document requirements.

Shop drawings are not required to depict supplemental reinforcing steel used to facilitate fabrication of products.

In lieu of shop drawings, submit the following to the Engineer:

1. The Framing Plan with product designations for all superstructure components.
2. Strand detensioning schedule.
3. Tensioning and elongation calculations.
4. Details of supplemental steel that remains as part of the finished product.
5. Drawings, details and spacing for embedded items associated with fall protection systems used on beams.
6. When proposing to use materials and/or methods that differ from the requirements of the Contract Documents, submit full plan details and Specifications for the alternate materials and methods. Ensure the alternate materials and methods meet the following requirements:

a. The provisions of the Contract Documents.

b. The AASHTO LRFD Bridge Design Specifications, edition with interims as referenced in Plans.

c. The recommendations of the material manufacturer.

d. Any materials change proposed by the Contractor and approved by the Engineer.

e. Net compressive stress in the concrete due to prestressing acting alone, after all losses, is not less than that provided by the stranding shown in the Plans.

f. Ultimate strength of the structure with the proposed changes is not less than the ultimate strength of the original design.

g. The provisions of the Departments Structures Design Guidelines.

450-6 Forms.

450-6.1 General: Use metal side and bottom forms, unless otherwise specified in the Contract Documents. For members with special shapes such as corner sheet piles, wood forms are permitted. Slab units and sheet piles may be cast on concrete surfaces meeting the profile dimensional tolerances of 450-6.3. Apply release agents in accordance with the manufacturer's recommendations. Liquid membrane curing compounds may be used to prevent bonding of slab products and sheet piles to the existing concrete surface, when applied in two or more coating. Ensure the last application of liquid membrane is applied immediately before placement of the slab or sheet pile.

For all beam members, use side forms designed to be removed without damaging the top flange of the beam. Remove the forms horizontally away from the beam by a method that prevents any contact of the form with the top flange after release of the form. Do not subject the top flange to any vertical force at any time. Include the form details and method of removal in the Producer QC Plan.

For all Florida-I Beams, use forms that do not have more than two horizontal joints.

Use void forms of a type for which service adequacy has been demonstrated, having sufficient strength to provide stability during handling and placing and to withstand hydrostatic pressures and other forces imposed upon them during concrete placement. Use form material that is neutral with respect to the generation of products harmful to the physical and structural properties of the concrete. Ensure that the presence of the form materials does not cause any detrimental effect to the concrete or other materials within the member. Positively vent all voids to the outside of the member. For end headers and inside forms, other materials capable of resisting the pressure from concrete are permitted, except that end headers used with CFRP strands must be either timber headers or steel headers with rubber grommets to protect the CFRP strands from damage.

Use end headers so designed that they can be placed and maintained in correct position between the side forms. Hold the headers in place with devices capable of being removed or loosened after the concrete has attained its initial set allowing free form expansion during curing methods that involve heat. Use end headers with openings conforming to the prestressing strand pattern to permit passage of the prestressing strand. Locate the openings accurately within 1/8 inch of planned location of prestressing strand elements.

Construct circular openings for strands a maximum of 1/4 inch larger than the nominal strand diameter. Construct square or rectangular openings a maximum of 1/4 inch larger, horizontally and vertically, than the nominal strand diameter. Ensure that all headers are mortar tight.

450-6.2 Supports: Use forms of sufficient thickness, with adequate external bracing and stiffeners, which are anchored to withstand the forces due to placement and vibration of concrete. Ensure that joints in forms are mortar tight. Support bottom forms on concrete pallets with metal stiffeners, wales or shims. Do not use timber elements between the bottom metal form and concrete pallets.

450-6.3 Alignment: Make and maintain during their use, forms and centering true to the shapes and dimensions for the product being produced. Plumb, align, and secure forms for each product in position before each reuse.

Apply the following tolerances to form alignment and pallets or beds used in prestressed construction:

1. Horizontal Alignment (horizontal deviation of side forms either side of a vertical plane within the length of a product) = 1/8 inch,
2. Vertical Alignment (vertical deviation of the bed or pallet from a horizontal plane within the length of a product) = 1/8 inch,
3. For vertical joints, Offset Between Adjacent Form Sections = 1/8 inch.
4. For horizontal joints, Offset Between Adjacent Form Sections = 1/16 inch.

450-6.4 End Header Locations:

450-6.4.1 General: Provide a minimum of 18 inches of exposed strands from the end header to the stressing anchorage and between adjacent ends of all products except 24 inches square and smaller piles. Provide a minimum of 6 inches of exposed strands between adjacent ends of 24 inches square and smaller piles.

450-6.4.2 Cold Weather: Provide a distance of at least 5 feet from the end header to the stressing anchorage, when the ambient temperature is expected to be below 55ºF between the time of tensioning and detensioning. When the ambient temperature is expected to be below 55ºF between the time of tensioning and detensioning and the product's exposed strands between the stressing anchorages are not protected, maintain a 25 foot minimum free length of stressed strands, between the end header and the stressing anchorage at each end of a bed line. When cold weather concrete conditions as specified in 450-10.1 are in effect, protect all exposed strands between stressing anchorages regardless of length. When the products and strands between stressing anchorages are protected, provide protection adequate to maintain the ambient temperature of the air around the strands at or greater than 55ºF until the products are detensioned or 24 hours after placing concrete, whichever is less.

450-6.5 Surface Conditions: Use clean, rust free form surfaces against which concrete is to be cast. Inspect forms and, if necessary, recondition them.

450-6.6 Form Ties: Ensure that no form wires or metal pieces are left within 2 inches of the surface of the finished concrete.

450-6.7 Corners, Angles and Joints: Ensure corners and angles are chamfered, mitered, or rounded with a radius of 3/4 inch, unless otherwise specified or shown in the Plans. Provide smooth mortar tight joints between panel forms within the alignment tolerances.

450-6.8 Form Release Agent: Before placing concrete, treat the facing of all forms with a form release agent in accordance with the manufacturer’s requirements. Ensure the application of form release agents does not contaminate prestressing strands and/or reinforcing steel.

450-7 Protection and Placement of Prestressing Strand.

450-7.1 Protection of Prestressing Strand: Maintain and store prestressing steel above the ground surface on platforms, skids, or other supports, to prevent contamination from below, and protect them from mechanical injury. Do not use any packaging or wrapping material that retains moisture at the bottom of the reel. Clean contaminated prestressing strand before use or otherwise

reject it. Handle prestressing strand carefully to prevent nicks or kinks. Do not expose steel prestressing strand to temperatures greater than 200ºF at any time. Do not expose CRFP prestressing strand to temperatures greater than 120°F at any time. Do not use arc welding equipment, including welding electrode lines, within 2 feet of prestressing strand. Do not perform any welding on forms that have been set in place after the prestressing strand is placed in the bed. Reject prestressing strand that has sustained any physical damage at any time.

450-7.2 Placing Prestressing Strand: Use care during placement of prestressing strand to avoid physical damage and contamination. Reject damaged strands. Do not use prestressing steel containing nicks, kinks, or former chuck grip marks. Do not use prestressing strand showing evidence of scale formation or which has become pitted. Remove and replace any damaged prestressing strand in the bed.

450-7.3 Cleanliness of Prestressing Strand: Inspect the prestressing strand for any evidence of contamination. Use strand that is free of deleterious materials such as grease, oil, wax, dirt, paint (except that used for marking identification) or other similar contaminants. Remove any contaminants detected from the strand before proceeding with fabrication activities. Rust on prestressing steel that can be removed by light rubbing is acceptable. Streaks or spots which may remain after rust removal are acceptable if no pitting is present.

450-7.4 Debonded Strands: Extend the tubular debonding material (sheathing) through the header for debonded prestressing strand. Tie and tape the debonding material at the terminus located at the inside of the member. Seal openings between strand and sheathing for debonded strands with 100% silicone sealant within seven calendar days of detensioning. The sealing of openings between strand and sheathing is not required for beams with ends not be encased in permanent concrete diaphragms per 450-11.5 and strand protection per 450-11.6. Use sheathing that is tubular non-slit, high-density plastic with a minimum wall thickness of 0.025 inch, and an inside diameter exceeding the maximum outside diameter of the pretensioning strand by 0.025 inch to 0.14 inch, which does not react with concrete, coating, steel, or FRP, and prevents the intrusion of water or cement paste during concrete placement.

Do not use strands debonded over the full length of a product.

450-8 Tensioning Equipment and Operations.

450-8.1 Equipment: Use a hydraulic jacking system that is adjustable to the automatic application and sustaining of a predetermined load, together with a pressure transducer or load cell built into the hydraulic system. Connect such pressure gage or transducer to a dial or digital readout and printer (manual recording of the tensioning operations is permitted) which will provide an instantaneous readout and record of the applied load in pounds. Use a jacking system with the capacity to induce the required load. Base the use of this system on demonstrated accuracy and repeatability of plus or minus 2% of anticipated load verified through comparison with loads indicated by an independent load cell.

Calibrate all jacking systems before using and repeat calibration at intervals not exceeding 12 months. Calibrate and recalibrate in accordance with the equipment manufacturer's recommendations, by qualified calibration agency or by plant personnel under the supervision of a Specialty Engineer.

Calibrate gages, jacks and pumps as a system in the same manner they are used in tensioning operations with the cylinder extension in the approximate position that it will be in actual

use at final jacking force. In multi-strand tensioning systems, gages may be calibrated against a master gage of known accuracy, provided that the other units of the system are calibrated against the same master gage. Ensure calibrations cover the load ranges that will be used during production. Verify the accuracy setting of the automatic cutoff valves by running the desired cutoff load. Ensure a certified calibration curve accompanies each tensioning system. Load readings can be used directly if the calibration determines a reading is within plus or minus 2% tolerance of anticipated load. Ensure calibration of load cells or proving rings used to calibrate jacking systems are on compression force testing equipment that has been calibrated in accordance with ASTM E74.

When any jack or gage appears to be giving erratic results, or if the jack force and elongation do not compare within specified limits and differences cannot be justified while work is in progress, recalibrate the equipment. Also verify the accuracy of the equipment after internal jacking system repairs or when gage and jacking units are switched.

Calibrate or recalibrate in accordance with ASTM E4 using equipment that is calibrated in accordance with ASTM E74. After calibration or recalibration has been completed, prepare a certificate and have it signed by the person in responsible charge of the verifications as outlined in ASTM E4 and ASTM E74. Ensure that the calibration report includes, the serial number of the equipment that is calibrated, calibration chart in a graph or tabular form, calibration date, temperature, full range of readings before and after calibration, National Institute of Standards and Technology's (NIST's) traceable number of calibration device, method of calibration, calibration agency, and laboratory or Engineer supervising the calibration.

Verify the accuracy of the jacking and recording system a minimum of once each week during tensioning operations by either an independently calibrated load cell, or by comparison with calculated strand elongation. When weekly verification is to be performed by comparison with calculated strand elongation, check a minimum of ten strands and the difference in the indicated load and the load determined from the elongation must agree within 5% of the computed theoretical load values. If the differences are greater than 5%, suspend the tensioning operation, evaluate the tensioning operation by qualified personnel and correct any deficiencies before proceeding.

When weekly verification is done by load cell, perform a minimum of five spot checks to the maximum anticipated load of strands. Use a load cell or proving ring that is calibrated in accordance with ASTM E74 and the accuracy of the force must be traceable to NIST. Maintain written records of readings obtained from the force recording system and verifying standard. Ensure the weekly verification record includes the serial number of the equipment, verification date, verification agency, NIST traceable number of calibration standard, and name of the person making the spot checks. The load reading from the recording system must agree within plus or minus 2% of the anticipated load indicated by the load cell or proving ring that are calibrated annually.

450-8.2 Operations:

450-8.2.1 General: The tensioning operations consist of the application of the final force or load which is the force required by the Plans and with the adjustments for abutment rotation, bed shortening, anchorage header movement, live end seating, dead end seating, splice chuck seating, friction in the jacking system and any other elements as applicable for the type of bed and anchorage being used. Also, adjust the force required by the Plans when the temperature differential between the ambient temperature at time of stressing and the expected concrete temperature at time of placement is greater than 25ºF. Increase the force at the rate of 1% for each 10ºF increment that the ambient temperature at time of stressing is below the expected concrete

temperature at time of placing. Decrease the force at the rate of 1% for each 10ºF that the ambient temperature at time of stressing is above the expected concrete temperature at the time of placing. Do not allow the stress in the steel prestressing strand to exceed 80% of the specified tensile strength of the strand, after seating. Do not allow the stress in the CFRP prestressing strand to exceed 65% of the specified tensile strength of the strand, after seating. During each tensioning operation, for the verification of the live and dead end seating, check the seating of at least 4 strands or a minimum of 10% of the total number of strands, whichever is greater. Maintain a record of the tensioning operation.

Compensation for temperature differential and abutment rotation are not required for self-stressing beds. However, adjust the final load for the effects of bed shortening due to the load from all the strands.

If the placement of concrete is delayed for more than seven calendar days after the completion of the stressing operation, check and adjust the final strand load as necessary before placement of concrete and maintain a record of the stressing operation.

Accomplish tensioning by either single strand tensioning or multiple strand tensioning, and ensure that it is symmetrical about the vertical axis of the product. Tensioning methods, in general, consist of tensioning to the required loads indicated by the jacking system, or tensioning to the required load while monitoring the elongation of the prestressing strand.

450-8.2.2 Single Straight Strand Tensioning: Apply an initial force of 5% to 25% of the final force to eliminate slack in the system. When single straight strand tensioning is used, tension the prestressing strand until the required final force is attained. Measure and record the force and elongation.

450-8.2.3 Multiple Straight Strand Tensioning: Apply the initial uniform tensioning load to each individual strand before the application of full tensioning load to the group of strands. The amount of the initial load will be influenced by the length of the casting bed and the size of strands in the group to be tensioned. The minimum initial tensioning load will be 5% of the required final load. Increase the magnitude of this load if deemed necessary but do not allow it to exceed 25% of the required final load. Then tension the strands by multiple strand tensioning to final load by pulling to elongation and checking against the jack load. Allow the required elongation to control the tensioning. The actual jack load must agree within 5% of the required load.

For uniform application of load to strands, the face of anchorage at final load must be in a plane parallel to its position under initial load. Verify this by measurement of movement on opposite sides of the anchorage and check its plumb position before and after application of the final load. During tensioning, allow the anchorage to move without restraint.

450-8.2.4 Draped Strand Tensioning: Tension draped strands by either partial tensioning and subsequent strains or by final tensioning in draped position.

Partial stressing and subsequent strains applies when the strands are tensioned through a combination of applied jack loads and strand uplift. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Bring the partially draped strand to an initial tension using a force in the range of 5% to 25% of the required final tensioning force. After application of the initial force, establish reference marks for measuring elongation. Apply a pre-calculated jacking force and measure elongations on a minimum of four strands. The average measured elongation must agree within 5% of the theoretical elongation

for strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. Allow the load indicated by the jacking system to control the tensioning for the pre-calculated load. Obtain the required final force by lifting or depressing the strand simultaneously at all pickup or hold down points or in an approved sequence as shown on the shop drawings. On each different bed setup, after lifting or depressing the strands to their final position, check the final force at the dead end of at least two strands on the bed. If the load is below the required tensioning force by more than 5%, adjust it to the final load.

When the final stressing is performed in the draped position, apply the tensioning load in two increments with the tendons being held in their draped positions. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Bring each strand to an initial tension of 5% to 25% of the final load before the application of the required final load. After application of the initial load, establish reference marks for measuring elongation. Then tension the strands to final load and measure the elongation. Allow the load indicated by the jacking system to control the tensioning for the initial and final loads. The measured elongation must agree within 5% of the theoretical elongation for the strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. When the jacking is performed at one end of the bed, check the applied load on two draped strands at the other end of the bed. If the load on the end opposite the jacking end is below the required value by more than 5%, adjust the load to the required final load.

450-8.2.5 Wire Breakage:

450-8.2.5.1 Steel Prestressing Strand: Limit wire breakage to 2% of the total area of the strands in any product and verify that breakage is not indicative of a more extensive distress condition, otherwise reject all stranding. Replace individual strands with more than one wire failure.

450-8.2.5.2 Fiber Reinforced Polymer (FRP) Prestressing Strand: Replace individual strands with any wire failure.

450-8.2.6 Position of Prestressing Strand: Position prestressing strand as shown in the Plans within the tolerances allowed in 450-2.1. Fix the required vertical and horizontal position of each prestressing strand at the ends of each product and at intervals within each product not exceeding 30 feet. Use the method of fixing the prestressing strand shown in the Producer QC Plan. When blocks are to be used for supporting prestressing strand, use those cast from concrete of the same mix design as used in the prestressed product. Stagger the location of blocks with an offset of 12 inches or greater and do not stack them.

450-9 Placement of Reinforcing Bars and Other Embedded Materials.

450-9.1 Reinforcing Bars and Supports: Tie and/or support in position all reinforcing steel in each product with other reinforcing bars in a manner that will accurately position the reinforcing bars throughout the fabrication process. Use types of ties and methods of tying recommended by the CRSI, including lacing. Do not tie reinforcing bars to debonded prestressing strands within the limits of the sheathing material.

Tie or lace beam stirrup bars at a minimum of three points. Tie reinforcing bars, other than stirrup bars in beam ends, as a minimum, at every other intersection. Either tie or lace spirals in piling at all four corners in the 1 inch pitch area, at the top corners and bottom center in the 3 inch pitch area, and at the top corners in the center area. Tie the bottom center in the pile center area as

necessary to maintain concrete cover. Bend all ties away from the form surface to provide maximum concrete cover.

When shown in the Plans, weld reinforcing steel in accordance with the requirements of AWS Structural Welding Code D 1.4. Do not weld in the prestressing bed.

450-9.2 Other Embedded Materials:

450-9.2.1 Inserts and Lifting Devices:

450-9.2.1.1 Placement: Locate inserts and lifting devices in accordance with the tolerances listed in 450-2.1. Use only non-metallic inserts and lifting devices with CFRP reinforced piling.

450-9.2.1.2 Corrosion Protection: Provide corrosion protection for embedded metal lifting devices that would remain exposed after construction.

After lifting operations using recessed metallic or non-metallic lifting devices are complete, backfill block-outs with a Type F epoxy compound meeting the requirements of Section 926 for a minimum distance of 2 inches beyond the perimeter of the metal device as measured parallel to the exposed concrete surface. If the block-out extends less than 2 inches beyond the perimeter of the metal device, extend the epoxy compound beyond the block-out along the concrete surface. If Type 304 or 316 stainless steel lifting devices are used, non-shrink grout meeting the requirements of Section 934 may be used to backfill the block-out within its limits.

After lifting operations using flush or protruding metallic or non-metallic lifting devices are complete, cut the lifting devices back to a minimum depth of 1 inch below the concrete surface and patch with a Type F epoxy compound meeting the requirements of Section 926. For all square prestressed piling, concrete sheet piling and concrete poles, cut and patch lifting devices before transporting from the casting yard.

450-9.2.2 Placement of Bearing Assemblies: Set bearing assemblies designed to transmit reaction forces to the concrete in the position shown in the Plans. Place bearing plate assemblies or shoes which are to be cast in a product within appropriate tolerances as provided in 450-2.1. Check the assemblies for position after stripping from the forms.

450-10 Concrete Operations.

450-10.1 Temperature Restrictions:

450-10.1.1 Cold Weather Concreting: When the temperature of the surrounding air is expected to be below 40ºF within 24 hours after placing concrete, the temperature of the plastic concrete as placed must be 55ºF or greater. Maintain the temperature of the concrete after placement at or above 55ºF for the first 24 hours or until detensioning, whichever occurs first. For piles and other members with a minimum section dimension of 12 inches or more, maintain the temperature of the concrete after placement at or above 50ºF for the first 24 hours or until detensioning, whichever occurs first. Make arrangements for heating, covering, insulating or housing the concrete work in advance of placement and maintain the required temperature without injury due to concentration of heat. Do not use direct fired heaters during the first 24 hours after concrete placement, unless actions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide. Continuously monitor the temperature of the concrete or the ambient air around the product until the product is detensioned. Monitor by the use of thermocouples located in the product cross-section or temperature recording devices located under the enclosure. Provide one thermocouple or temperature recording device for each 200 feet of bed length or part thereof. Locate the thermocouples within the products cross- section as shown in the Producer QC Plan or as approved by the Engineer. Record the monitored temperatures determined by each thermocouple. Review the recorded temperatures to ensure that they are within the specified limits. Initially

calibrate recording devices or thermocouples and recalibrate them at least annually in accordance with the manufacturer's recommendations.

450-10.1.2 Hot Weather Concreting: Meet the requirements of Section 346 for temperature requirements and special measures for mixing concrete in hot weather.

Apply fog mist spray of water to prestressing strands, steel reinforcing, FRP reinforcing, and steel forms just before placing the concrete when the hot weather concreting special measures are in effect and the temperature of steel forms or reinforcing steel is greater than 120ºF.

450-10.2 Protection of Concrete from Weather: Have protection materials available before the concrete placement begins to cover the products in the event of rain during the placement of concrete. Protection materials may be tarps, curing blankets, or other impervious material that will not puncture when placed over protruding reinforcing and/or form elements. Include the method and materials for protection in the Producer QC Plan.

450-10.3 Concrete Placement:

450-10.3.1 General: Check forms, reinforcing bars, prestressing strand, vent pipes, anchorages and other embedded items for compliance with the Contract Documents before placing concrete. Place concrete in accordance with 400-7, except as modified herein.

For concrete operations conducted at night, provide enough lighting to allow visual inspection of the interior of the forms during the complete concrete placement operation.

Convey concrete by the use of buckets, conveyors, pumps, troughs, or other equipment specifically designed for concrete conveyance, provided the placement method consistently produces quality concrete with no segregation or separation of the mix. Locate the concrete conveyance equipment within 12 inches of the top of the forms or surface of the concrete to minimize the free fall of the concrete.

Multiple placements may be used within a bedline, provided compliance with 450-11.1 is maintained.

450-10.3.2 Requirements for Successive Layers: Except for self-consolidating (self-compacting) concrete, place concrete as described in 450-10.3.2.1 through 450-10.3.2.5 as shown in the Producer QC Plan or as approved in writing by the Engineer.

In any progressive concrete placement operation, do not allow the time between successive placements onto previously placed concrete to exceed 20 minutes, unless the previously placed concrete has not yet stiffened, as evidenced by the continued effective use of vibration.

450-10.3.2.1 AASHTO Type II, Florida-I Beam 36 and Double-T Beams, Piling and Precast Slab Units (Except Voided Piling and Slabs): Place concrete in one or more layers or lifts. If more than one layer is used for Double-T Beams, end the first layer such that the top of the concrete is slightly below the bottom of the flange.

450-10.3.2.2 AASHTO Type III, Type IV and Florida-I Beams 45 and 54 and Voided Units (Slabs and Piling): Place concrete in a minimum of two horizontal layers. The thickness of the first layer will be such that the top of the concrete is just above the top of the bottom flange. In voided units, end the first layer slightly above the middle height of the void. Fill the form by the last layer.

450-10.3.2.3 All Beams 63 Inches or Deeper: Place concrete in a minimum of three horizontal layers. The thickness of the first layer will be such that the top of the concrete is

slightly above the top of the bottom flange. The thickness of the second layer will be such that the top of the concrete is slightly above the bottom of the top flange. Fill the beam forms by the last layer.

450-10.3.2.4 Pretensioned I Beams Containing Longitudinal Post- tensioning Ducts: Place concrete in one continuous lift beginning in the end block zone and progressing to the other end. Do not allow the progression of the concrete placement to proceed until previously placed concrete has been properly consolidated, and the rate of advancement equals the ability to fill the forms. In progression of the placement, deposit concrete within the forms on the surface of previously placed concrete.

450-10.3.2.5 Florida U Beams: Place the concrete in Florida U Beams in a minimum of two horizontal layers. The thickness of the first layer shall be such that the top of the concrete is above the top of the bottom flange.

450-10.4 Vibration of Concrete: Except for self-consolidating concrete, consolidate concrete in steel reinforced piling by internal or external vibration, or combination of these methods. For CFRP strand reinforced piling, use self-consolidating concrete without the use of vibration. If further consolidation is needed, manual rodding is permitted.

Design external form vibrators for the specific use. Design forms used in conjunction with external vibration and build them to effectively transmit vibration to the concrete mass. Mount and operate form vibrators in compliance with the vibrator manufacturer's written recommendations, a copy of which must be on file at the prestressed concrete plant. Secure vibrators to the form mounts by positive locking devices so that maximum vibration is transmitted into the form. Modify or replace external form vibrator systems that are
demonstrated to be ineffective. Operate vibrators at each mount location for the time necessary for complete concrete consolidation. Do not allow progressive points of vibration to exceed twice the visually effective radius of vibration. Keep forms equipped with external vibrators clean, and free of any buildup of hardened concrete.

Ensure internal vibrators are available before concrete placement is started. Use an internal vibrator with a head of such size that proper vibration of the concrete will be secured without causing movement of the prestressing strand or reinforcing bars. The vibrating frequency range must be 8,000 to 15,000 impulses per minute. Have at least one standby vibrator available on-site. Insert the vibrator in the concrete at points spaced to ensure uniform vibration of the entire mass of the concrete. Do not allow points of insertions to be further apart than the radius over which the vibrator is visibly effective. Allow the vibrator to sink into the concrete by its own weight and allow it to penetrate into the underlying layers sufficiently so that the two layers are thoroughly consolidated together. After the concrete is thoroughly consolidated, slowly withdraw the vibrator to avoid formation of holes.

Revise the existing placement and consolidation procedure to improve the consolidation of the concrete, if the existing placement and consolidation procedure have produced unacceptable surface defects such as honeycombing, aggregate or mortar pockets, and excessive air bubbles.

450-10.5 Finishing:

450-10.5.1 General: When concrete incorporating silica fume is used, screed and finish with a continuous water fog mist maintained above the concrete. Do not apply the fog directly toward the concrete. The Contractor may apply a monomolecular finishing aid approved by the Engineer in accordance with the manufacturer's recommendation.

450-10.5.2 Beams: Rough float the top surface of the beam and then scrub it transversely with a coarse brush or metal tine to produce a roughened surface for bonding. For the other external surfaces of prestressed beams, unless otherwise specified, apply a General Surface Finish in accordance with 400-15.1. Remove mortar leakage and stains to produce beams with a uniform appearance.

450-10.5.3 Piling: Unless a Class 5 Applied Finish Coating is otherwise specified, apply a general surface finish as specified in Section 400 to pile surfaces, except that pointing with mortar will not be required for cosmetic chips and bug holes with a depth less than 1/4 inch and a diameter of less than 3/4 inch. All other general surface finish requirements will apply, including the pointing of material form tie cavities with mortar. Surface finish deficiencies that meet the definition of noncomplying prestressed products must be corrected in accordance with 450-12. Miter or round the top corners similar to the corner radius of the pile forms. Surfaces exposed during casting must have a steel trowel finish.

450-10.5.4 Slabs and Double-T Beams: When the Plans show the top surface of prestress slab or Double-T Beams units to be the riding surface, apply a Class 4 floor finish in accordance with Section 400. When the Plans show the surface to be overlaid with asphalt or concrete, rough float the top surface and then scrub it transversely with a coarse brush to remove all laitance and to produce a roughened surface for bonding. For the other external surfaces of slabs and double-T beams, unless otherwise specified, apply a General Surface Finish in accordance with 400-15.1.

450-10.6 Curing: Cure prestressed concrete as required for a minimum duration of 72 hours. If forms are loosened upon setting of concrete and/or removed before the 72 hour curing period is complete, expand the curing to cover the newly exposed surfaces by either coating with curing compound or extending the continuous moist cure area. Maintain concrete surface moisture at all times until curing is begun. If a water sheen is not present, apply supplemental moisture by fog misting or prevent water sheen loss on flat work by use of an evaporation retarder.

After the finishing operations have been completed and as soon as the concrete has hardened sufficiently to permit the application of curing material without marring the exposed surface, cover the exposed surfaces of all prestressed concrete products by one of the following procedures or other alternate curing methods. Alternate curing methods and details proposed by the Contractor must be approved by the Engineer. Base alternate curing methods upon a demonstrated ability to retain surface moisture of the concrete and to control curing temperatures within acceptable limits. Discontinue use of any alternate curing method other than those included herein upon any indication of noncompliance with this Specification.

450-10.6.1 Continuous Moisture: Place burlap on the surface and keep it continuously saturated for the curing period by means of soil soakers, leaking pipes, or automatic sprinklers. Do not apply moisture manually. If side forms are removed during the curing period, extend the burlap to completely shield the sides of the product. Water flow may be metered to cycle repetitively for five minutes on and five minutes off during the 72 hour curing period. When it is not practical to apply moisture or curing compound inside the voided piles, cover their ends with wet burlap to prevent moisture loss.

450-10.6.2 Membrane Curing Compound: Apply a white Type 2 curing compound to all surfaces in a single-coat, continuous operation, at a uniform coverage as recommended by the manufacturer but not less than 1 gallon per 150 square feet. Apply the curing compound on the concrete surfaces that are still damp but no free standing water. Allow surfaces covered by the

membrane curing compound to remain undisturbed for the curing period. Recoat any cracks, checks or other defects in the membrane seal which are detected during the curing period within one hour. If side forms are loosened during the curing period, remove them at that time and immediately coat the formed surfaces with a clear membrane curing compound and maintain the surface seal for the remainder of the curing period. Bottom surfaces must be similarly coated after removal of the forms. Remove membrane curing compound to applied surfaces of concrete products to which other concrete is to be bonded by sandblasting or water- blasting until all traces of membrane curing compound are removed.

When the curing compound is applied by spraying, use a compressor driven sprayer of sufficient size to provide uniform spray at the nozzle. Keep all nozzles clean to ensure a uniform application of compound. For compressor driven sprayers, provide a calibrated reservoir which will allow the quantity of applied materials to be accurately determined. Maintain standby equipment in case of mechanical failure. If a mechanical failure occurs, a hand held pump-up sprayer may be used to apply curing compound to the remainder of the products cast in the day's production. Suspend additional concrete placements until the mechanical sprayer is functioning properly.

450-10.6.3 Curing Blankets: Curing blankets may be used for curing the top surfaces of products. Do not use curing blankets which have been torn or punctured. Securely fasten edges to provide as tight a seal as practical. Allow curing blankets to remain in place for the curing period. Should the system fail to maintain a moist condition on the concrete surface, discontinue the use of curing blankets and take immediate corrective action to prevent further loss of concrete moisture.

450-10.7 Accelerated Curing:

450-10.7.1 General: Use low-pressure steam curing, radiant heat curing or continuous moisture and heat curing. Do not use low-pressure steam or radiant heat curing with CFRP piling. If accelerated curing is completed before the curing period has elapsed, continue curing for the remaining part of the curing period in accordance with one of the curing methods above.

If accelerated curing is used, furnish and use temperature recording devices that will provide accurate, continuous, and permanent records of the time and temperature relationship of the enclosure and concrete throughout the entire curing period. Place the temperature recording sensors at a minimum of two locations, spaced approximately at or near the third point of bed length, to measure the temperatures of the enclosure and concrete. Initially calibrate recording thermometers and recalibrate them at least annually in accordance with manufacturer's recommendations. Place the sensors at the center of gravity of the bottom flanges for beams. Place the sensors at the center of gravity of the cross sections normal to pile length for solid piles, and at the midpoint of the wall thickness of the pile for voided piles.

When the ambient air temperature is equal to or higher than 50ºF, start the accelerated curing by supplying or retaining moisture and the application of the heat, following the initial set period of concrete. Determine the initial set time in accordance with ASTM C403. During the application of heat, do not allow the temperature rise in the concrete product to exceed 36ºF per hour. The maximum curing temperature of the enclosure or concrete must not exceed 150ºF. Maintain the maximum curing temperature uniform throughout the enclosure, with variation of not more than 20ºF from the maximum peak temperature until concrete reaches the required release strength. Allow the concrete element to cool gradually at the maximum cooling rate of 50ºF per hour and continue the cooling at this rate until the concrete temperature is 40ºF or less above the ambient temperature outside the curing enclosure.

When the ambient air temperature is below 50ºF cure the concrete in two stages. Start the accelerated curing of the first stage during the preset period by applying heat to increase the temperature of concrete at the maximum rate of 10ºF per hour. The total temperature gain of concrete during the initial set period cannot exceed 40ºF higher than the placement temperature, or 104ºF, whichever is less. Upon obtaining the initial set, continue curing as stated above for ambient temperature of 50ºF or higher. To prevent moisture loss on exposed surfaces during the preheating period, cover products as soon as possible after casting or keep the exposed surfaces wet by fog spray or wet blankets. Use enclosures for heat curing that allow free circulation of heat about the product and that are constructed to contain the heat with a minimum moisture loss. The use of tarpaulins or similar flexible covers may be used provided they are kept in good repair and secured in such a manner to prevent the loss of heat and moisture. Use enclosures that cover the entire bed from stressing abutment to stressing abutment, including all exposed stranding.

450-10.7.2 Low-Pressure Steam: The steam must be in a saturated condition. Do not allow steam jets to impinge directly on the concrete, test cylinders, or forms. Cover control cylinders to prevent moisture loss and place them in a location where the temperature is representative of the average temperature of the enclosure.

450-10.7.3 Curing with Radiant Heat: Apply radiant heat by means of pipe circulating steam, hot oil or hot water, or by electric heating elements. To prevent moisture loss during curing, keep the exposed surfaces wet by fog spray or wet blankets.

450-10.7.4 Continuous Moisture and Heat: This method consists of heating the casting beds in combination with the continuous moisture method described above. Do not allow the heating elements to come in direct contact with the concrete or the forms. The initial covering of burlap and the continuous application of moisture will be as described in 450-10.6. An auxiliary cover in addition to the burlap for retention of the heat will be required over the entire casting bed. Support this cover a sufficient distance above the product being cured to allow circulation of the heat.

450-10.8 Curing Requirements for Silica Fume Concrete: Use either a 72 hour continuous moisture curing or a (12-24) hour low-pressure steam curing in accordance with 450-10.7. Upon completion of the low-pressure steam curing, continue curing for the remaining part of the 72 hour curing period by application of the curing compound, continuous moisture curing, or use of the curing blankets.

If 72 hour continuous moisture is used, begin curing silica fume concrete immediately after the finishing operation is complete and keep a film of water on the surface by fogging until the curing blankets are in place. No substitution of alternative methods nor reduction in the time period is allowed. After completion of the 72 hour curing period, apply a membrane curing compound to all concrete surfaces. Apply curing compound according to 450-10.6.

450-10.9 Form Removal: Do not remove forms sooner than six hours after casting and not until the concrete strength is sufficient to avoid structural damage. For AASHTO Type V, Type VI, Florida-I Beams, and Bulb-T Beams, do not remove the forms supporting the top flange concrete sooner than 12 hours after casting unless the release strength has been reached.

450-11 Detensioning.

450-11.1 General: The required concrete strength at which the prestressing force may be transferred to the concrete in a product will be a minimum of 4,000 psi, unless specified otherwise in the Plans. Verify the release strength by compressive strength cylinder tests or other approved

means, no later than 24 hours after casting and every 24 hours thereafter until release strength is developed. In lieu of every 24 hour testing, the contractor is permitted to estimate the strength development of concrete by the maturity method in accordance with ASTM C1074, the pulse velocity method in accordance with ASTM C597, or any other nondestructive test method acceptable to the Engineer, until the time of the detensioning. Before detensioning, verify the concrete release strength by testing the compressive strength test cylinders. Make a minimum of two compressive strength release test cylinders daily for each individual mix or for each LOT, or fraction thereof, of given concrete mix design where the daily consumption exceeds this volume or when non-continuous batching or dissimilar curing is used. The release strength test, representing the LOT, is the average compressive strength of two test cylinders, which are cured under conditions similar to the product or match-cured test specimens, which are match cured until the time of release. For products cured using accelerated curing, release the prestressing force immediately after terminating the accelerated curing process. After the detensioning operation is completed, continue to 72 hour curing period using one of the methods listed in 450-10.6. For products cured using methods other than accelerated curing, release the prestressing force within a detensioning time limit, not to exceed five calendar days after the verification of release strength by compressive strength cylinder test or other approved strength gain monitoring system. For all products in a casting line, use the same test method for determining their release strengths. Ensure the detensioning time limit is included in the Producer QC Plan. Cure concrete cylinders used for detensioning strength tests in the same manner and location as the prestressed concrete products.

For I-girders, where side forms are loosened upon setting of concrete or removed before the 72 hour curing period is complete, the top flange dormant strands may be released after the concrete reaches a compressive strength of 2,000 psi.

450-11.2 Method of Stress Transfer: In all detensioning operations, keep the prestressing forces nearly symmetrical about the vertical axis of the product and apply them in a manner that will minimize sudden shock or loading. Remove or loosen forms, ties, inserts, or other devices that would restrict longitudinal movement of the products along the bed. Release hold-downs for products with draped strands in a sequence as shown in the Plans or Producer QC Plan. Cut dormant strands (partially tensioned strands) in top of beams before releasing any fully tensioned strands. Release fully bonded strands next, beginning with the lowest row and moving upwards, followed progressively by strands having the minimum length of tubular sheathing through to those strands having the maximum length of tubular sheathing. The Contractor may propose alternative detensioning patterns to suit the plant's particular operation. Specify the method of the stress transfer to be used either in the Producer QC Plan or the construction submittal.

Transfer prestressing forces to the concrete by either single strand release or multiple strand release.

450-11.3 Single Strand Detensioning: Detension the strand by using a low-oxygen flame in accordance with a pattern and schedule provided in the approved shop drawings, or Producer QC Plan, or described in 450-5. Heat with a low-oxygen flame played along the strand for a minimum of 5 inches. Heat strands in such a manner that the failure of the first wire in each strand will occur after the torch has been applied for a minimum of five seconds. Release strands in all prestressed products simultaneously and symmetrically about the vertical axis at both ends of the bed and at all intermediate points between products to minimize sliding of products. As an alternate, strands in piles, sheet piles, slabs and AASHTO Type II girders may be released simultaneously and symmetrically about the vertical axis at both ends of the bed until all the strands are released, then proceeding in

order to intermediate points nearest the bed ends, or to the single remaining point at the center and release strands at these points in the same manner until all strands are released. For CFRP strands coupled with steel strands, detension the steel strands first using the flame cutting process described above. At intermediate locations where CFRP strands are continuous between adjacent precast components, flame or shear cutting of the strands is not allowed.

450-11.4 Multiple Strand Detensioning: In this method, detension all strands simultaneously by hydraulic dejacking. The total force is taken from the header by the jack, then released gradually. Do not allow the overstress required to loosen the anchoring devices at the header to exceed the force in the strand by 5%. After detensioning, strands at all points may be cut progressively from one end of the bed to the other using equipment and methods described above.

450-11.5 Cutting Strands and Bars: Upon completion of the detensioning operation, cut steel strands to required length, using an oxygen flame or mechanical cutting device. Do not use electric arc welders to cut bars or steel strands. Upon completion of the detensioning operation, cut CFRP strands to the required length using a mechanical cutting device. Do not use flame or shear cutting to cut CFRP strands.

450-11.5.1 Beams: For beam ends that will be permanently encased in concrete diaphragms, cut strands to 2.5 inches plus or minus 0.5 inch beyond the end of the product or as specified in the Plans. For beams with ends that will not be encased in permanent concrete diaphragms, mechanically cut strands a minimum of 1/8 inch below the concrete surface.

450-11.5.2 Piles: Mechanically cut strands flush with the concrete surface. For top (head) of fender piles and pile ends not embedded under final conditions, burn the strands a minimum of 1 inch below the concrete surface and clearly mark the pile to identify the top (head) end.

450-11.5.3 Poles: Mechanically cut strands to a minimum of 1/8 inch below the concrete surface.

450-11.6 Protecting Ends of Strands: Prepare the concrete surfaces and apply Type F-1 epoxy in accordance with the manufacturer's recommendations.

450-11.6.1 Beams: For beam ends that will not be permanently encased in concrete diaphragms, apply two layers of epoxy to the exposed beam ends (including clipped and chamfered surfaces) within seven calendar days of detensioning and prior to development of any corrosion at the ends of strands. The finished thickness of the epoxy coating must be a minimum of 1/16 inch and form a vertical flat plane without deviations or localized depressions from recessed strands or other defects.

450-11.6.2 Piles: Apply epoxy patches to all recessed strands.

450-11.6.3 Poles: Coat entire face of tip (top) and butt (bottom) ends with epoxy.

450-12 Noncomplying Prestressed Products.

450-12.1 General: When a precast prestressed concrete product does not comply with the requirements of this Section or is damaged, use the following provisions for evaluating and disposing of deficiencies. However, when precast prestressed concrete products have been installed, the disposition of concrete cracks shall be in accordance with 400-21. Apply these provisions in all cases that clearly fall under the circumstances described. Consider situations not covered by these specific circumstances on their individual merits. Consider and apply the following where practical.

The QC Manager, or QC inspectors under direction of the QC Manager, will examine all deficiencies within the time limit specified in 450-2.1 and 450-2.3, to determine the applicable

provisions and requirements of this Article and which course of action is appropriate. If the QC Manager determines that a deficiency is a cosmetic or minor defect, appropriate repairs may be executed immediately in accordance with 450-13. Perform and complete cosmetic and minor defect repairs to the satisfaction of the QC Manager. If the QC Manager determines that a deficiency is a major deficiency, requiring an engineering evaluation, submit a repair proposal to the Engineer in accordance with 450-14. Make all repairs that require a repair proposal under the observation of and to the satisfaction of the QC Manager.

The disposition of deficiencies and repair methods provided herein must at no time, and under no circumstances, be used as an excuse for or applied in such a manner so as to relieve the Contractor of his responsibility for QC. The number and type of deficiencies evaluated under this Specification will, however, be used in evaluating the Contractor's QC.

The Engineer will require a credit on any product with deficiencies that require engineering evaluation and are attributable to the Contractor, accepted for use in the structure. Bear the costs of repairs and any actions taken to rectify deficiencies at no expense to the City.

450-12.2 Surface Deficiencies: Surface deficiencies are defined below. Regardless of the types of deficiencies, when the total surface area of all deficiencies within a single product exceeds 2.0 % of the product's length times its depth, the product will require engineering evaluation and disposition in accordance with 450-14. Surface deficiencies include spalls, chips, bug holes, surface porosities, and honeycombs.

450-12.2.1 Bug Hole: A bug hole is a void caused by air that is entrapped against the form and that has an area up to 3.0 square inches and a depth up to 1.5 inches. Treat any bug hole with a dimension exceeding either of these dimensions as a honeycomb. The Engineer will not require the Contractor to repair any bug hole with a depth less than 0.25 inch and less than 0.75 inch in diameter, unless otherwise indicated in the Plans or Specifications. Consider all other bug holes cosmetic and repair them in accordance with 450-13.2.

450-12.2.2 Spall: A spall is a depression resulting when a fragment is detached from a larger mass by impact, action of weather, by pressure or by expansion within the larger mass.

A cosmetic spall is a circular or oval depression not greater than 1.0 inch in depth nor greater than 3.0 square inches in area, and must be repaired in accordance with 450-13.2.

With the exception of spalls in the bearing areas and edge of the top flange, a minor spall is defined as a spall not larger than 2.0 square feet and no deeper than one inch plus the sum of the concrete cover and the diameter of the bar in the first layer of reinforcing. Repair minor spalls in accordance with 450-13.4.

Spalls located at the edges of the top flange are considered minor spalls as follows:

1. A spall on one edge of the top flange, without a coincident spall on the other edge of the top flange, is considered a minor spall if the total longitudinal length of the defect does not exceed 10 feet and any lateral dimensions of the spall measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

2. Coincident spalls on opposite edges of the top flange are considered minor spalls if the total length of the defects within both spalls does not exceed 10 feet and any lateral dimensions of the spalls at a given location measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

Spalls located in the bearing area that extend back into the concrete within the limits above the bearing plate are considered major spalls.

A major spall is a spall that any of its dimensions exceeds the dimensions that are described for minor spalls. A major spall requires engineering evaluation and disposition in accordance with 450-14.

450-12.2.3 Chip: A chip is the local breaking of the corners or edges of the concrete with the resulting void containing angular surfaces.

Cosmetic chips are chips where the sum of the two lateral dimensions perpendicular to the length does not exceed 2.0 inches. Regardless of length, it is not necessary to repair cosmetic chips except for visually exposed reinforcing steel, prestressing strand, insert, or weldments surfaces, which may require repair in accordance with 450-13.5.

Minor chips are chips where the sum of the two lateral dimensions perpendicular to the length exceeds 2.0 inches, but does not exceed 4.0 inches, and with a length of no more than 12.0 inches. Repair minor chips in accordance with 450-13.5.

Major chips are any chips larger than minor chips. Major chips require engineering evaluation and disposition in accordance with 450-14.

450-12.2.4 Surface Porosity: Surface porosity is considered a minor defect and is the localized porosity of a formed surface due to medium scaling. Medium scaling is defined as the loss of surface mortar up to 3/8 inch in depth and exposure of concrete aggregate. Repair surface porosity in accordance with 450-13.3.

450-12.2.5 Honeycombing: Honeycombing is voids in the concrete, loss of fines or other material from between the aggregate particles, the inclusion of air pockets between aggregate particles, or larger volumes of lost material. Remove honeycombing in its entirety to sound concrete before establishing the classification of the defect.

Minor honeycombing is a void no deeper than concrete cover and no larger than 2.0 square feet in area that results after the removal of unsound material. Repair minor honeycombing in accordance with 450-13.6.

Major honeycombing is a void deeper than concrete cover regardless of the surface area, or shallower but with a surface area greater than 2.0 square feet that results after the removal of unsound material. Major honeycombing requires engineering evaluation and disposition in accordance with 450-14.

450-12.3 Formed Surface Misshaping: Formed surface misshaping is the visual and measurable deficiency or excess of material from the specified tolerance on any surface of a product.

450-12.3.1 Pile Ends: Make square pile ends which are outside this Section's tolerances by grinding in accordance with 450-13.7, or any other means of removal as approved by the Engineer. Reshape the chamfer if more than 0.25 inch from the cast pile end is removed and such removal affects the chamfer dimension.

450-12.3.2 Pile Chamfers: Reshape chamfers outside of this Section's tolerances to within the tolerances in accordance with 450-13.7.

450-12.3.3 Other Surfaces: Any deficiency exceeding the plan dimensions for size, length, squareness, designated skew, plumbness, and the like by up to twice the specified plus (+) tolerance may be corrected by grinding to within the allowable tolerance in accordance with 450-13.7. Any deficiency exceeding the specified minus (-) tolerance or twice the specified plus (+) tolerance requires an engineering evaluation and disposition in accordance with 450-14.

450-12.4 Bearing Areas: Consider the bearing area to extend from the end of the product to 3 inches beyond the edge of the bearing contact area for the full product width.

Do not allow the bearing plate or bearing area plane of precast prestressed concrete beam and slab units to deviate from a true plane by more than 1/8 inch when tested in all directions with a steel straightedge. In the event that a 100% true plane is not achieved, the Engineer will accept a surface having not less than 80% of its area in a true plane provided the deviations are evenly distributed. Remove minor convex projections by grinding with an abrasive stone. The Engineer will accept minor depressions, provided that they amount to not more than 20% of the bearing area, are evenly distributed over the entire bearing area, and are not deeper than 1/8 inch.

450-12.5 Cracks: A crack is the separation of a product or portion thereof which may appear before or after detensioning and may or may not cause separation throughout the product thickness or depth. Identify cracks by the classifications and locations described below and subject them to the disposition required by the identified crack. If the total surface length of all cracks within a single product, regardless of width, located between the end zones exceeds one- quarter of the product's length, an engineering evaluation and disposition in accordance with 450-14 is required. Establish crack sizes subsequent to release of all pretensioning forces.

The Engineer will reject any pile that is cracked to the point that a transverse or longitudinal crack extends through the pile, shows failure of the concrete as indicated by spalling of concrete on the main body of the pile adjacent to the crack, or which in the opinion of the Engineer will not withstand driving stresses. Occasional hairline surface cracking caused by shrinkage or tensile stress in the concrete from handling will not be cause for rejection.

450-12.5.1 Classification and Treatment of Cracks: Regardless of cause and for the purposes of Section 450, cracks in precast prestressed components, excluding piling, will be identified according to their surface appearance in accordance with the following classifications:

Cosmetic cracks are any cracks which are less than 0.006 inch wide and are located in non-critical locations on the product. Based on the environmental classification of the site where the product will be located, treat cosmetic cracks as follows:

1. Slightly or moderately aggressive environment: Do not treat cracks.
2. Extremely aggressive environment: After detensioning, apply penetrant sealer in accordance with Section 413.

Minor cracks are any cracks which are between 0.006 and 0.012 inch wide, inclusive, and are located in non-critical locations on products. Based on the environmental classification of the site where the product will be located and the final elevation of the product on the site, treat minor cracks as follows:

1. Slightly aggressive environment: Do not treat the cracks.
2. Moderately aggressive environment:
   a. For products that will be located at an elevation of more than 12 feet above the existing ground level or above mean high water elevation: Do not treat cracks.
   b. For products that will be located at an elevation within 12 feet above the existing ground level or above mean high water elevation: Apply a penetrant sealer on the cracks after detensioning in accordance with Section 413.
3. Extremely aggressive environment:

a. For products that will be located at an elevation of more than 12 feet above the existing ground level or above mean high water elevation: Apply a penetrant sealer on the cracks after detensioning in accordance with Section 413.

b. For products that will be located at an elevation within 12 feet above the existing ground level or above mean high water elevation: Inject epoxy into the cracks after detensioning in accordance with Section 411.

Major cracks are any cracks of any width which are located in critical locations on products or cracks in non-critical locations of the product that are greater than 0.012 inch wide. Major cracks require an engineering evaluation, including crack depth measurement and disposition, in accordance with 450-14.

Cracks in the Riding Surface: Repair cracks in the top surface of components which will become the riding surface (with no overlays), once in service, regardless of the environmental classification as follows:

1. Epoxy inject cracks wider than 0.006 inch in accordance with Section 411, unless the Engineer approves the sealing of cracks with high molecular weight methacrylate in accordance with Section 413.

2. Seal cracks that are 0.006 inch wide or less by applying a penetrant sealer in accordance with Section 413.

450-12.5.2 Locations of Cracks: Regardless of cause and for the purposes of this Specification, cracks will be identified as occurring in either critical or non-critical locations of the product in accordance with the following criteria and conditions:

Critical locations of cracks are any locations in which a crack would tend to open under stresses occurring at any time during the service life of the structure, or which may reduce the ultimate capacity or fatigue life of the product. Specifically, critical locations of cracks are any locations in a product not defined and not included in 450-12.5.3 as non-critical. Cracks in critical locations require engineering evaluation and disposition in accordance with 450-14.

Non-critical locations of cracks are defined by the position within a product's length, the position within a product's depth, and the orientation of the crack.

450-12.5.3 Non-critical Locations of Cracks by Product Type:

450-12.5.3.1 Piles: Surface cracks in any direction and of a length not exceeding twice the width of the pile.

450-12.5.3.2 All Types of Simple Span Pretensioned Concrete Beams:

End zones (within a distance of three times the depth of the product from the end):

1. Horizontal or diagonal cracks at either or both ends in the top flange and web of the product, not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed the product's depth.

2. Vertical cracks extending through the top flange not to exceed one-half of the product's depth after detensioning.

Mid-span region (between end zones): Vertical cracks extending through the top flange and web of the product.

Any Location: Horizontal crack at the interface of the web and top flange which is not longer than the product's depth.

Intermediate diaphragms of Florida U-Beams: cracks at any location.

450-12.5.3.3 Simple Span Double-T Beams:

End zones (within a distance of twice the depth of the product from the end): One horizontal crack at either or both ends and in the top flange of the product, not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed half the product's depth.

Mid-span Region (between end zones): Vertical cracks extending through the top flange and not exceeding half the web depth of the product.

Any Location: Horizontal crack at the interface of the web and top flange which is not longer than the product's depth.

450-12.5.3.4 Pretensioned I-Beams Containing Longitudinal Post-tensioning Ducts:

End zones (within a distance of twice the depth of the beam from the end): Vertical cracks in the bottom half of the beam within an end zone with no post- tensioning anchorages and where the post-tensioning ducts are located in the top of the beam at the location of a permanent substructure support. Horizontal or diagonal cracks at either or both ends in the top flange and web of the product where no post-tensioning anchorage zone is present.

Mid-span Region (between quarter points): Vertical cracks in the web and top flange of the beam provided the beam is to be supported at each end in its final position in the structure.

Any Location: Horizontal cracks not longer than the beam's depth and only at the interface of the web and top flange provided the beam is to be supported at each end in its final position in the structure.

450-12.5.3.5 Post-Tensioned Beams for Drop-In Spans:

Pier Sections: Horizontal or diagonal cracks at either or both ends in the top flange and web of the product.

Drop-In Sections: Same as simple span pretensioned concrete beams.

End Sections: At end of beam with post-tensioning anchorages: same as Pretensioned I-Beams Containing Longitudinal Post-tensioning Ducts. At end of beam adjacent to pier sections: same as for simple span pretensioned concrete beams.

450-12.5.3.6 Simple Span Prestressed Slab Units:

End Zones (within a distance of twice the depth of the product from the end): One horizontal crack at either or both ends in the top half of the product, which is not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed half the product's depth.

Any Location (after detensioning): Vertical cracks in the top half of the product's depth.

450-12.5.3.7: Pretensioned Concrete Poles:

Longitudinal cracks: The length of each crack must be less than twice the base width of the pole.

Transverse or diagonal cracks: Cracks perpendicular to or at an inclined angle to the longitudinal direction of the pole. The length of each crack must be less than two-thirds of the base width of the pole.

Edge cracks: Cracks exhibiting at the edge and extending across one or two adjacent planes of a square pole. The total length of each crack must be less than 2.0 inches.

450-13 Repair Methods and Materials.

450-13.1 General: Before beginning the repair of bug holes, spalls, chips, surface porosity, and honeycomb, remove all laitance, loose material, form oil, curing compound and any other deleterious matter from repair area. Repair cosmetic and minor deficiencies by methods specified herein. The Contractor is permitted to elect an alternate repair method. Submit the alternative repair methods in writing to the Engineer for approval prior to performing repairs. For each project maintain the record of deficiencies and their repair methods. Ensure the record includes information about product description, unit serial number, date cast, defect description including dimensions, repair method and materials, defect discovery date, and signature of producer's QC Manager indicating concurrence with the information.

Cure repaired surfaces for the full 72 hour curing time or for the curing time as recommended by written recommendations from the manufacturer of the repair material. Ensure the repaired surfaces have a surface texture, finish and color which matches the appearance of the unaffected surrounding area of the product.

450-13.1.1 Product Acceptance on the Project: Use only non-shrink grout that is listed on the Approved Product List (APL).

450-13.2 Cosmetic Surface Filling: Repair areas to be filled with an approved high- strength, non-metallic, non-shrink grout meeting the requirements of Section 934. Mix, apply and cure the grout in accordance with the manufacturer's recommendations. Coating of the prepared surface with epoxy bonding agent before grout placement is not required.

450-13.3 Surface Restoration: Maintain the surface continuously wet for a minimum of three hours before application of repair material. Repair areas to be restored with a mortar mix consisting by volume of one part cement, 2.5 parts sand that will pass a No. 16 sieve, and sufficient water to produce a viscous slurry mix or repair areas to be restored with an approved high-strength, non-metallic, non-shrink grout meeting the requirements of Section 934. Mix, apply and cure the grout in accordance with the manufacturer's recommendations. Cure areas repaired with a mortar mix in accordance with 450-10.6. Coating of the prepared surface with epoxy bonding agent before grout placement is not required.

450-13.4 Cutting and Filling: Carefully cut all feathered edges of the area to be repaired back perpendicular to (or slightly undercut from) the surface to the depth of sound concrete or to a minimum depth of 1/2 inch, whichever is deeper. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations. Fill the cutout area with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. Firmly consolidate the grout mix in the cutout area.

450-13.5 Restoration of Surfaces and Edges: When reinforcing steel or prestressing strand is exposed, remove concrete from around the items to provide a 1 inch clearance all around. Form surfaces and edges to the original dimensions and shape of the product. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations. Restore surfaces and edges with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. Firmly consolidate the grout mix in the area to be repaired. Restore surfaces and edges to the original dimensions and shape of the product.

450-13.6 Removal and Restoration of Unsound Concrete: Carefully cut the area of unsound concrete to be repaired back perpendicular to (or slightly undercut from) the surface and to the depth of sound concrete or to a minimum depth of 1 inch, whichever is deeper. When reinforcing bars,

prestressing strand, inserts or weldments are exposed, remove the concrete from around the items to provide a 1 inch clearance all around. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations and then filled with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. Firmly consolidate the grout mix in the area to be repaired. Restore surfaces and edges to the original dimensions and shape of the product.

450-13.7 Surface Grinding: Grind off misshaped formed surfaces with an abrasive stone. Apply two coats of penetrant sealer in accordance with the requirements of Section 413, to any surfaces which are not subsequently encased in concrete, immediately after grinding has been accepted. Do not apply a penetrant sealer to any surfaces to be subsequently encased in concrete.

450- 13.8 Treatment of Cracks: Treat cracks in accordance with 450-12.5.

450-14 Submittal of Proposal to Accept or Repair Deficiencies.

450-14.1 General: When a product has deficiencies unacceptable to the Engineer, the Contractor may propose repairs. Deficiencies discovered in the casting yard must be repaired before shipment. Do not ship products, which require repairs, from the casting yard to the project site until such repairs are complete and the Engineer has determined the product to be acceptable. Deficiencies discovered at the project site may be repaired at the site, subject to the Engineer's approval. All proposed repairs must be submitted for engineering evaluation and credit in accordance with 450-14.2, unless the specific repair methods have been submitted and approved. The plant may use the repair method that is previously approved in the Producer QC Plan, without submittal of the proposal for engineering evaluation or credit. The use of the previously approved repair method is only applicable to the same type of single deficiency that is exhibited in a product.

450-14.2 Submittal of Repair Proposal:

The repair proposal must be completed by the Contractor's Engineer of Record and shall consist of the following:

1. A cover letter prepared on the Contractor's letterhead addressed to the Engineer describing the product.

2. Information in a format acceptable to the Engineer describing the details of the non-compliance and the proposed repairs.

3. An engineering evaluation: A structural performance and durability evaluation which explains why the performance and durability of the repaired deficient product is acceptable as compared to that of an undamaged comparable product. The evaluation must be supported by one or more of the following types of information:

a. Written evidence of a previously approved comparable deficiency and its repair.

b. Documented research that demonstrates the proposed repair to be effective.

c. If applicable, engineering calculations providing support for recommendations.

4. A proposed credit to the Contract proportionate to the product's deficiency. The credit is in addition to the cost for review and evaluation of the proposal.

5. Any other supportive information, pictures and drawings. For cracked elements, show on a drawing the location, average width, depth, length, and termination points of each crack along the surfaces. Provide the distance from each termination point to a fixed reference

point on the component, such as beam end or edge of flange. The description of the proposed repair and the structural and durability evaluation of the product must be prepared by or under the direct supervision of the Contractor's Engineer of Record and must bear their signature and seal.

If the proposal is accepted by the Engineer, all City costs associated with review of the proposal, including the cost of any and all engineering evaluation and testing services required, will be deducted from payment to the Contractor, but not to exceed 15% of the product value based on unit bid prices.

Include in the proposed credit consideration of the City's added costs which may include but are not necessarily limited to re-inspection, testing, reduced durability, or increased maintenance cost. The Engineer will review and evaluate the Contractor's proposal and will notify the Contractor of its disposition. The Engineer's review of the Contractor's proposal does not amend or delete code requirements, unless such changes are specifically brought to the Engineer's attention and accepted by the Engineer. The Engineer's acceptance of a proposal does not relieve the Contractor of his responsibility to provide products that are structurally adequate to resist the loads specified in the Contract drawings and that maintain the intended aesthetic, durability and maintenance aspects of the product. The Engineer will not accept repaired products unless repairs are made as proposed or described, the resulting repairs are sound in all aspects, and the repairs are aesthetically acceptable. Replace a rejected product with a product meeting the requirements of the Contract Documents at no additional expense to the City.

450-15 Repairs Before Approval.

If repairs to precast products are initiated in advance of the Engineer's approval, the affected product will only be considered for acceptability and use when the following conditions have been satisfied:

1. Before beginning the repairs, submit to the Engineer a repair proposal in accordance with the requirements of 450-14.
2. All repair materials must meet the requirements of Section 930 and be selected from the APL or otherwise be subsequently evaluated, tested by the Contractor as required by the City, and approved by the City for the specific use made of the material.
3. Repairs have been performed under the observation of the QC Manager. Accept responsibility for actions taken, and perform these actions at your own risk. It is intended that repairs be made only after the proposed methods have been accepted to ensure that the proposal will not be modified or rejected, and the work will be accepted if the repair proves to be adequate.

450-16 Handling, Storage, Shipping and Erection.

450-16.1 Handling: All products which are pretensioned may only be handled after transfer of the prestressing force. For products that are prestressed by a combination of pretensioning and post-tensioning do not handle before sufficient prestress has been applied to sustain all forces and bending moments due to handling. Exercise care in handling to prevent damage to products. Lift and move products so as to minimize stresses due to sudden changes in momentum. Calculate pick up and dunnage points. Pick up products only at points designated as pickup points as shown on the Contract Plans or shop drawings. Maintain all beams in an upright position at all times.

Evaluate the temporary stresses and stability of beams during their handling. The temporary stresses induced into the products during handling must be within the acceptable stresses

at release listed in the City's Structures Design Guidelines. Take appropriate action to increase the stability of products during handling when the factor of safety against lateral buckling instability is below 2.0. Include the expected fabrication tolerance for sweep in the analysis. The analysis procedure provided by the Precast/Prestressed Concrete Institute or similar procedures may be used for the stability evaluation.

Verify lifting devices for capacity in lifting and handling products, taking into account various positions during handling. Keep multiple component lifting devices matched to avoid non-compatible use. When a product has multiple lifting devices, use lifting equipment capable of distributing the load at each device uniformly to maintain the stability of the product. When the lifting devices are grouped in multiples at one location, align them for equal lifting.

Take appropriate steps to prevent the occurrence of cracking. When cracking occurs during handling and transportation, revise handling and transporting equipment and procedures as necessary to prevent cracking for subsequent products.

450-16.2 Storage: Store precast prestressed beams, Double-T Beams and slab units on only two points of support located within 18 inches of the end of the product or as calculated. Support skewed beams, Double-T Beams or slab units within 18 inches of the end of the full product section or as calculated. Support other products on an adequate number of supports so as to keep stresses in the products within the allowable stresses at release listed in the City's Structures Design Guidelines. Locate multiple supports (more than two) within 1/2 inch of a horizontal plane through the top surface of the supports. Adequately brace beams as necessary to maintain stability.

All supports must be level and on adequate foundation material that will prevent shifting or differential settlement which may cause twisting or rotation of products. Immediately pick up products in storage that have rotated or twisted and adjust the supports to provide level and uniform support for the product.

Support prestressed products that are stacked by dunnage placed across the full width of each bearing point and aligned vertically over lower supports. Do not use stored products as a storage area for either shorter or longer products or heavy equipment.

Where feasible, base the selection of storage sites, storage conditions and orientation upon consideration of minimizing the thermal and time-dependent creep and shrinkage effects on the camber and/or sweep of the precast pretensioned products.

Continuous application of water during the initial 72 hour moist curing period may be interrupted for a maximum of one hour to allow relocation of precast prestressed concrete elements within the manufacturing facility. Keep the moist burlap in place during relocation of the element.

Measure and record the sweep and camber of beams monthly. Keep the measurement records on file for review at any time by the Engineer, and upon request, submit these measurements to the Engineer. If the camber exceeds by 1 inch the design camber shown in the Plans, take appropriate actions in accordance with 400-7.13.1 to accommodate the product in the structure.

If the sweep exceeds the tolerance specified, take immediate measures to bring the sweep of the product back to within tolerance.

Notify the Engineer immediately when the sweep or camber exceeds the specified tolerances. Special storage conditions for the purpose of removing excessive sweep will not be restricted by requirements of this Subarticle nor contained in 450-2.1. If the sweep of the product exceeds the tolerance specified and cannot be removed, the disposition of the product will be in accordance with 450-12.1 and 450-14.

450-16.3 Shipping: Do not ship precast prestressed concrete products to the project site prior to the completion of the 72 hour curing period and attainment of the required 28-day strength. The contractor is permitted to verify the shipping strength test, before 28 days, by testing compressive strength cylinders that are cured under the conditions similar to the product or by testing temperature match cured cylinders. The use of maturity method, ASTM C1074, pulse velocity method in accordance with ASTM C597, or any other nondestructive test method acceptable to Engineer, is permitted to estimate the strength before its verification by test cylinders. The shipping strength test is the average compressive strength of two test cylinders. Do not ship products until accepted and stamped by the QC Manager or the inspectors under the direct observation of the QC Manager. At the beginning of each project, provide a notarized statement to the Engineer from a responsible company representative certifying that the plant will manufacture the products in accordance with the requirements set forth in the Contract Documents and Producer QC Plan. The QC Manager's stamp on each product indicates certification that the product was fabricated in conformance with the Producer QC Plan, the Contract, and this Section. Ensure that each shipment of prestressed concrete products to the project site is accompanied with a signed or stamped delivery ticket providing the description and the list of the products.

Evaluate the temporary stresses and stability of all products during shipping and locate supports, generally within 18 inches from the beam end, in such a manner as to maintain stresses within acceptable levels. Include impact loadings in the evaluation.

450-16.4 Erection: Erect precast prestressed products without damage. Meet the handling and storage requirements of 450-16.1 and 450-16.2 for field operations. Before casting diaphragms and the deck slab, do not allow the horizontal alignment of prestressed concrete beams to deviate from a straight line connecting similar points of beam ends by more than the sweep tolerances specified in 450-2.1. Adequately brace beams as necessary to maintain stability.

450-17 Measurement and Payment.

450-17.1 General: The work specified in this Section will be measured and paid for as shown below for the particular item involved. Precast prestressed concrete members are acceptable to the City for full payment when all requirements of the Contract Documents have been met. No partial payments will be made for precast prestressed concrete members until the 28-day strength requirement, along with other applicable Specification requirements, have been met.

450-17.2 Prestressed Concrete Piling: Payment will be made at the Contract unit price per foot for the particular type of piling, measured and paid for as specified in Section 455, including the provisions for cutoffs and splices.

450-17.3 Prestressed Concrete Beams: Payment will be made at the Contract unit price per foot for Prestressed Beams, complete in place and accepted. Final pay lengths will be plan quantity based on casting lengths, as detailed in the Plans, subject to the provisions of 9-3.2.

450-17.4 Prestressed Concrete Slab Units: Payment will be made at the Contract unit price per foot for the units, complete in place and accepted. Final pay lengths will be plan quantity based on casting lengths, as detailed in the Plans, subject to the provisions of 9-3.2.

450-18 Basis of Payment.

Price and payment will be full compensation for all work and materials specified in this Section, including reinforcement, pretensioning strand, embedded ducts, hardware, inserts and other materials as required, to fabricate, transport and place the product into its permanent position in the structure.

Payment for the items will be made under the following:

Item No. 450- 1- Prestressed Beams - per foot.
Item No. 450- 2 Prestressed Beams: Florida-I Beams – per foot.
Item No. 450- 3- Prestressed Slab Units - per foot.
Item No. 450- 4- Prestressed Beam U-beams - per foot.
Item No. 450- 88- Prestressed Slab Units Transversely Post-Tensioned - square foot.

SECTION 455 - STRUCTURES FOUNDATIONS

A. GENERAL

455-1 General Requirement.

The Contractor may examine available soil samples and/or rock cores obtained during the soil boring operations at the appropriate District Materials Office.

455-1.1 Monitor Existing Structures: Monitor existing structures in accordance with Section 108.

455-1.2 Excavation: Complete all excavation of the foundations prior to installing piles or shafts unless otherwise authorized by the Engineer. After completing pile/shaft installation, remove all loose and displaced materials from around the piles/shafts, leaving a clean, solid surface. Compact the soil surface on which concrete is to be placed or which will support the forming system for the concrete to support the load of the plastic concrete without settling or causing the concrete to crack, or as shown in the Contract Documents. The Engineer will not require the Contractor to compact for excavations made below water for seals or when the footing or cap or forming system (including supports) does not rest on the ground surface.

455-1.2.1 Abutment (End Bent) Fill: Place and compact the fill before installing end-bent piling/shafts, except when:

1. driving specified test piling in end bents or,
2. the Plans show uncased piles through proprietary retaining wall fills.

When installing piles/shafts or casing prior to placing fill, take necessary precautions to prevent displacement of piles/shafts during placing and compacting fill materials within 15 feet of the piles/shafts or casing. Reference and check the position of the piles/shafts or casing at three approximately equal intervals during construction of the embankment.

Place embankment material in 6 inch loose lifts in the 15 foot area around the piles/shafts or casing. Compact embankment material within the 15 foot area adjacent to the piles/shafts or casing to the required density with compaction equipment weighing less than 1,000 pounds. When installing piles/shafts prior to the completion of the surrounding fills, do not cap them until placing the fills as near to final grade as possible, leaving only the necessary working room for construction of the caps.

Provide permanent casings installed prior to placement of the fill, for all drilled shafts through mechanically stabilized fills (for example, behind proprietary retaining walls) for shafts installed after fill placement. Install temporary casings through the completed conventional fill when permanent casings are not required.

Provide permanent casings, if required, before the fill is placed extending a sufficient distance into the existing ground to provide stability to the casings during construction of the abutment fill.

455-1.3 Cofferdams: Construct cofferdams as detailed in the Plans. When cofferdams are not detailed in the Plans, employ a qualified Specialty Engineer to design cofferdams, and to sign and seal the plans and specification requirements. Send the designs to the Engineer for his records before beginning construction.

Provide a qualified diver and a safety diver to inspect the conditions of the foundation enclosure or cofferdam when the Contract Documents require a seal for construction. Equip these divers with suitable voice communications, and have them inspect the foundation enclosure and

cofferdam periphery including each sheeting indentation and around each piling or drilled shaft to ensure that no layers of mud or other undesirable materials were left above the bottom of seal elevation during the excavation process. Also have the divers check to make sure the surfaces of the piles or drilled shafts are sufficiently clean to allow bond of the concrete down to the minimum bottom of seal elevation. When required, ensure that there are no mounds of stone, shell, or other authorized backfill material left after placement and grading. Assist the Engineer as required to ensure that the seal is placed as specified and evaluate the adequacy of the foundation soils or rock. Correct any deficiencies found by the divers. Upon completion of inspection by the divers, the City may also elect to inspect the work before authorizing the Contractor to proceed with subsequent construction operations. Submit a written report by the divers to the Engineer indicating the results of their underwater inspection before requesting authorization to place the seal concrete.

455-1.4 Vibrations on Freshly Placed Concrete (Drilled Shafts and Piers): Ensure that freshly placed concrete is not subjected to vibrations greater than 1.5 inches per second from pile driving and/or drilled shaft casing installation sources located within the greater dimension of three shaft diameters (measured from the perimeter of the shaft closest to the vibration source) or 30 feet (from the nearest outside edge of freshly placed concrete to the vibration source) until that concrete has attained its final set as defined by ASTM C403 except as required to remove temporary casings before the drilled shaft elapsed time has expired.

455-2 Static Compression Load Tests.

455-2.1 General: Employ a professional testing laboratory, or Specialty Engineer with prior load test experience on at least three projects, to conduct the load test in compliance with these Specifications, to record all data, and to submit reports of the test results to the Engineer except when the Contract Documents show that the City will supply a Geotechnical Engineer to provide these services.

Perform the load test by applying a load up to the load required in the Contract Documents or to the failure load, whichever occurs first.

Do not apply test loads to piles sooner than 48 hours (or the time interval shown in the Plans) after driving of the test pile or reaction piles, whichever occurs last.

Allow up to four weeks after the last load test for the analysis of the load test data and to provide all the estimated production tip elevations. If the Contractor is willing to construct production foundation elements in areas designated by the Engineer, tip elevations will be determined in these areas beginning seven days after the receipt of the load test data which represents the designated area.

Do not begin static load testing of drilled shafts until the concrete has attained a compressive strength of 3,400 psi. The Contractor may use high early strength concrete to obtain this strength at an earlier time to prevent testing delays.

Load test piles/shafts in the order directed by the Engineer. The City will furnish certain load test equipment and/or personnel when shown in the Plans. Inspect all equipment to be furnished by the City at least 30 days prior to use, and notify the Engineer of any equipment that is not in satisfactory operating condition. The City will consider any necessary repairs ordered by the Engineer to place the equipment in satisfactory operating condition as Unforeseeable Work. Provide the remainder of the equipment and personnel needed to conduct the load tests. Unless shown otherwise in the Contract Documents, provide all equipment, materials, labor, and technical personnel required to conduct the load tests, including determination of anchor reaction member depths. In this case, provide a loading apparatus designed to accommodate the maximum load plus an adequate safety factor.

While performing the load test, provide safety equipment, and employ safety procedures consistent with the latest approved practices for this work. Include with these safety procedures, adequate support for the load test plates and jack to prevent them from falling in the event of a release of load due to hydraulic failure, test pile/shaft failure, or any other cause.

Include in the bid the cost of transporting load test equipment and instrumentation supplied by the City from their storage location to the job site and back. Handle these items with care. The Contractor is responsible for the safe return of these items. After completion of the static load tests, return all City furnished equipment in satisfactory operating condition. Repair all damage to the test equipment furnished by the City to the satisfaction of the Engineer. Clean all areas of rust on structural steel items, and recoat those areas in accordance with Section 560. Return all load test equipment supplied by the City within 30 days after completing the load tests.

The Contractor is responsible for the equipment from the time it leaves its storage area until the time it is returned. During this time, insure the equipment against loss or damage for the replacement cost thereof (the greater of $150,000 or the amount shown in the Plans) or for the full insurable value if replacement cost insurance is not available.

Notify the Engineer at the preconstruction conference, or no later than 30 days before beginning test pile installation, of the proposed testing schedule so that items supplied by the City may be reserved. Notify the City at least ten working days before pick-up or return of the equipment. During pick-up, the City will complete a checklist of all equipment placed in the Contractor's possession. The City will later use this checklist to verify that the Contractor has returned all equipment. Provide personnel and equipment to load or unload the equipment at the City's storage location. Provide lifting tongs or nylon slings to handle City owned test girders. Do not perform cutting, welding, or drilling on City owned girders, jacks, load cells, or other equipment.

455-2.2 Loading Apparatus: Provide an apparatus for applying the vertical loads as described in one of the following:

1. As shown and described in the Contract Documents.

2. As supplied by the Contractor, one of the following devices designed to accommodate a load at least 20% higher than that shown in the Contract Documents or described herein for test loads:

a. Load Applied by Hydraulic Jack Acting Against Weighted Box or Platform: Construct a test box or test platform, resting on a suitable support, over the pile, and load it with earth, sand, concrete, pig iron, or other suitable material with a total weight greater than the anticipated maximum test load. Locate supports for the weighted box or platform at least 6 feet or three pile/shaft diameters, whichever is greater, measured from the edge of the pile or shaft to the edge of the supports. Insert a hydraulic jack with pressure gauge between the test pile or shaft and the underside of the reaction beam, and apply the load to the pile or shaft by operating the jack between the reaction beam and the top of the pile or shaft.

b. Load Applied to the Test Pile or Shaft by Hydraulic Jack Acting Against Anchored Reaction Member: Construct reaction member anchorages as far from the test piles/shafts as practical, but in no case closer than the greater of 3 pile/shaft diameters or 6 feet from the edge of the test pile/shaft. Attach a girder(s) of sufficient strength to act as a reaction beam to the upper ends of the anchor piles or shafts. Insert a hydraulic jack with pressure gauges between the head of the test pile/shaft and the underside of the reaction beam, and apply the test load to the pile/shaft by operating the jack between the reaction beam and the pile/shaft head.

If using drilled shafts with bells as reaction member anchorages, locate the top of the bell of any reaction shaft anchorage at least three shaft diameters below the bottom of the test shaft.

c. Combination Devices: The Contractor may use a combination of devices (a) and (b), as described above, to apply the test load to the pile or shaft.

d. Other systems proposed by the Contractor and approved by the Engineer: When necessary, provide horizontal supports for loading the pile/shaft, and space them so that the ratio of the unsupported length to the minimum radius of gyration of the pile does not exceed 120 for steel piles, and the unsupported length to the least cross-section dimension does not exceed 20 for

concrete piles or drilled shafts. Ensure that horizontal supports provide full support without restraining the vertical movement of the pile in any way.

When required by the Contract Documents, apply a horizontal load to the shaft either separately or in conjunction with the vertical load. Apply the load to the test shaft by hydraulic jacks, jacking against Contractor provided reaction devices. After receiving the Engineer's approval of the proposed method of load application, apply the horizontal load in increments, and relieve it in decrements as required by the Contract Documents.

455-2.2.1 Modified Quick Test:

1. Loading Procedure: Apply vertical loads concentric with the longitudinal axis of the tested pile/shaft to accurately determine and control the load acting on the pile/shaft at any time. Place the load on the pile/shaft continuously, in increments equal to approximately 5% of the maximum test load specified until approaching the failure load, as indicated by the measuring apparatus and/or instruments. Then, apply increments of approximately 2.5% until the pile/shaft "plunges" or attains the limiting load. The Engineer may elect to stop the loading increments when he determines the Contractor has met the failure criteria or when a settlement equal to 10% of the pile/shaft width or diameter is reached. Apply each load increment immediately after taking and verifying the complete set of readings from all gauges and instruments. Apply each increment of load within the minimum length of time practical, and immediately take the readings. Complete the addition of a load increment and the completion of the readings within 5 to 15 minutes. The Engineer may elect to hold the maximum applied load up to one hour.

Remove the load in decrements of about 10% of the maximum test load. Remove each decrement of load within the minimum length of time practical, and immediately take the readings. Complete the removal of a load decrement and the taking of the readings within 5 to 15 minutes. The Engineer may also require up to two reloading cycles with five loading increments and three unloading decrements. Record the final recovery of the pile/shaft until movement is essentially complete for a period up to one hour after the last unload interval.

2. Failure Criteria and Nominal Resistance: Use the criteria described herein to establish the failure load. The failure load is defined as the load that causes a pile/shaft top deflection equal to the calculated elastic compression plus 0.15 inches plus 1/120 of the pile/shaft minimum width or the diameter in inches for piles/shafts 24 inches or less in width, and equal to the calculated elastic compression plus 1/30 of the pile/shaft minimum width or diameter for piles/shafts greater than 24 inches in width. Consider the nominal resistance of any pile/shaft so tested as either the maximum applied load or the failure load, whichever is smaller.

455-2.3 Measuring Apparatus: Provide an apparatus for measuring movement of the test piles/shafts that consists of all of the following devices:

1. Wire Line and Scale: Stretch a wire as directed by the Engineer between two supports located at a distance at least:

a. 10 feet from the center of the test pile but not less than 3.5 times the pile diameter or width.

b. 12 feet from the centerline of the shaft to be tested but not less than three shaft diameters.

Locate the wire supports as far as practical from reaction beam anchorages. At over-water test sites, the Contractor may attach the wire line as directed by the Engineer to the sides of the service platform. Mount the wire with a pulley on one support and a weight at the end of the wire to provide constant tension on the wire. Ensure that the wire passes across the face of a scale mounted on a mirror attached to the test pile/shaft so that readings can be made directly from the scale. Use the scale readings as a check on an average of the dial readings. When measuring both horizontal and vertical movement, mount separate wires to indicate each movement, horizontal or vertical. Measure horizontal movements from two reference wires set normal to each other in a horizontal.

2. Wooden Reference Beams and Dial Gauges: Attach wooden reference beams as detailed in the Plans or approved by the Engineer to independent supports. For piles, install the greater of 3.5 times the pile diameter or width or 10 feet from the centerline of the test pile. For drilled shafts, install at the greater of three shaft diameters or 12 feet from the centerline of the shaft to be tested. Locate the reference beam supports as far as practical from reaction beam anchorages. For over-water test sites, the Contractor may attach the reference beams as directed by the Engineer between two diagonal platform supports. Attach dial gauges, with their stems resting either on the top of the pile/shaft or on lugs or similar reference points on the pile/shaft, to the fixed beams to record the movement of the pile/shaft head. Ensure that the area on the pile/shaft or lug on which the stem bears is a smooth surface which will not cause irregularities in the dial readings.

For piles, the minimum acceptable method for measuring vertical movement is two dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 180 degrees or at the diagonal corners of the pile.

For shafts, ensure that three dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 120 degree intervals around the shaft, are the minimum acceptable method for measuring vertical movement. Ensure that four dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 90 degree intervals are the minimum required for measuring horizontal movement.

3. Survey Level: As a check on the dial gauges, determine the elevation of a point near the top of the test pile/shaft (on plan datum) by survey level at each load and unload interval during the load test. Unless approved otherwise by the Engineer, level survey precision is 0.001 foot. Alternately, the surveyor may read an engineer's 50 scale attached near the pile/shaft head. Determine the first elevation before applying the first load increment; make intermediate readings immediately before a load increment or an unload decrement, and after the final unload decrement that completely removes the load. Make a final reading at the time of the last recovery reading or as directed by the Engineer.

For over-water test sites, when shown in the Plans or directed by the Engineer, the Contractor shall drive an H pile through a 36 inch casing to provide a stable support for the level and to protect it against wave action interfering with level measurements. Provide a suitable movable jig for the surveyor to stand. Use a jig that has a minimum of three legs, has a work platform providing at least 4 feet width of work area around the casing, and is approved by the Engineer before use. The described work platform may be supported by the protective casing when approved by the Engineer.

455-2.4 Load Test Instrumentation:

1. General: The intent of the load test instrumentation is to measure the test load on top of the pile/shaft and, when provided in the Contract Documents, its distribution between side friction and end bearing to provide evaluation of the preliminary design calculations and settlement estimates and to provide information for final pile/shaft length design. Ensure that the instrumentation is as described in the Contract Documents.

When requested by the Engineer, provide assistance during installation of any instrumentation supplied by the City. Supply 110 V, 60 Hz, 30 A of AC electric power in accordance with the National Electric Code (NEC) to each test pile/shaft site during the installation of the instrumentation, during the load testing, and during any instrumented redrives ordered by the Engineer.

Place all of the internal instrumentation on the rebar cage before installation in the test shaft. Construct the rebar cage at least two days before it is required for construction of the test shaft. Provide assistance during installation of instrumentation supplied by the City, including help to string, place, and tie the instrumentation and any assistance needed in moving or repositioning the cage to facilitate installation. Place the rebar cage in one segment complete with its instrumentation. The Engineer may require multiple lift points and/or a suitable "stiffleg" (length of H pile or other

suitable section) to get the cage in a vertical position without causing damage to the instrumentation. Successfully demonstrate the lifting and handling procedures before the installing instrumentation.

2. Hydraulic Jack and Load Cell: Provide hydraulic jack(s) of adequate size to deliver the required test load to the pile/shaft unless shown otherwise in the Plans. Before load testing begins, submit a certificate from a reputable testing laboratory showing a calibration of gauge readings for all stages of jack loading and unloading for jacks provided. Ensure that the jack has been calibrated within the preceding six months unless approved otherwise. Recalibrate the jack after completing load testing if so directed by the Engineer. Ensure that the accuracy of the gauge is within 5% of the true load.

Provide an adequate load cell approved by the Engineer that has been calibrated within the preceding six months. Provide an approved electrical readout device for the load cell. Before beginning load testing, submit a certificate from a reputable testing laboratory showing a calibration of readings for all stages of loading and unloading for load cells furnished by the Contractor. Ensure that the accuracy of the load cell is within 1% of the true load.

If the City supplies the Contractor with the jack and/or load cell, have the equipment calibrated and include the cost in the cost for static load test.

3. Telltales: When shown in the Contract Documents, provide telltales that consist of an unstressed steel rod placed, with appropriate clearance and greased for reducing friction and corrosion, inside a constant-diameter pipe that rests on a flat plate attached to the end of the pipe at a point of interest shown in the Plans. Construct telltales in accordance with details shown in the Contract Documents. Install dial gauges reading to 0.001 inch with 1 inch minimum travel as directed by the Engineer to measure the movement of the telltale with respect to the top of the pile/shaft.

4. Embedded Strain Gauges: When shown in the Contract Documents, provide strain gauges which shall be placed in the test shaft to measure the distribution of the load. Ensure that the type, number, and location of the strain gauges are as shown in the Plans or as directed by the Engineer. Use strain gauges that are waterproof and have suitable shielded cable that is unspliced within the shaft.

455-2.5 Support Facilities: Furnish adequate facilities for making load and settlement readings 24 hours per day. Provide such facilities for the instrumented area, and include lighting and shelter from rain, wind, and direct sunlight.

455-2.6 Load Test Personnel Furnished by the Contractor: Provide a certified welder, together with necessary cutting and welding equipment, to assist with the load test setup and to make any necessary adjustments during the load test. Provide personnel to operate the jack, generators, and lighting equipment, and also provide one person with transportation to assist as required during load test setup and conducting of the load tests. Provide qualified personnel, as determined by a Specialty Engineer or testing lab, required to read the dial gauges, take level measurements, and conduct the load test, except when the Contract Documents show that the City will provide these personnel.

455-2.7 Cooperation by the Contractor: Cooperate with the City, and ensure that the City has access to all facilities necessary for observation of the conduct and the results of the test.

455-2.8 Required Reports: Submit a preliminary static load test report to the Engineer within five days after completing the load test. When the Contract Documents do not require internal instrumentation, submit the final report within ten days after completing the load test. Submit the final report of test results for internally instrumented shafts within 30 days after completing the load test. Include in the report of the load test the following information:

1. A tabulation of the time of, and the amount of, the load and settlement readings, and the load and recovery readings taken during the loading and unloading of the pile/shaft.

2. A graphic representation of the test results, during loading and unloading of pile/shaft top movement as measured by the average of the dial gauge readings, from wireline readings and from level readings.

3. A graphic representation of the test results, when using telltales, showing pile/shaft compression and pile/shaft tip movement.

4. The estimated failure and safe loads according to the criteria described herein.

5. Remarks concerning any unusual occurrences during the loading of the pile/shaft.

6. The names of those making the required observations of the results of the load test, the weather conditions prevailing during the load test, and the effect of weather conditions on the load test.

7. All supporting data including jack and load cell calibrations and certificates and other equipment requiring calibration.

8. When the Contract Document requires internal instrumentation of the pile/shaft, furnish all of the data taken during the load test together with instrument calibration certifications. In addition, submit a report showing an analysis of the results of axial load and lateral load tests in which soil resistance along and against the pile/shaft is reported as a function of deflection.

Submit the necessary reports prepared by the Specialty Engineer responsible for collection and interpretation of the data, except when the Contract Documents show that the City will provide a Geotechnical Engineer.

455-2.9 Disposition of Loading Material: After completing all load tests, clean, remove all rust and debris from City equipment, repaint all areas having damage to the paint in accordance with Section 560, and return all load test equipment supplied by the City to its designated storage area. Repair any structural damage to City owned equipment to the satisfaction of the Engineer. Notify the City at least ten working days in advance so that arrangements can be made to unload the equipment. Remove all equipment and materials, which remains the Contractor's property, from the site. Clean up and restore the site to the satisfaction of the Engineer.

455-2.10 Disposition of Tested Piles/Shafts: After completing testing, cut off the tested piles/shafts, which are not to be incorporated into the final structure, and any reaction piles/shafts at an elevation 24 inches below the finished ground surface. Take ownership of the cut-offs and provide areas for their disposal.

B. PILING

455-3 Description.

Furnish and install concrete, steel, or wood piling including driving, jetting, preformed pile holes, cutting off, splicing, dynamic load testing, and static load testing of piling.

455-4 Classification.

The City classifies piling as follows:

1. Treated timber piling.
2. Prestressed concrete piling.
3. Steel piling.
4. Test piling.
5. Sheet piling.
    a. Concrete sheet piling.
    b. Steel sheet piling.
6. Polymeric Piles (see Section 471 for requirements).

455-5 General Requirements.

455-5.1 Site Preparation:

455-5.1.1 Predrilling of Pile Holes: Predrilled pile holes are either starter holes to the depth described in this section or holes drilled through embankment/fill material down to the natural

ground surface. When using low displacement steel piling such as structural shapes, drive them through the compacted fill without the necessity of drilling holes through the fill except when the requirements for predrilling are shown in the Plans. When using concrete or other high displacement piles, drill pile holes through fill, new or existing, to at least the elevation of the natural ground surface. Use the range of drill diameters listed below for square concrete piles.

12 inch square piles ..... 15 to 17 inches
14 inch square piles ..... 18 to 20 inches
18 inch square piles ..... 22 to 26 inches
20 inch square piles ..... 24 to 29 inches
24 inch square piles ..... 30 to 34 inches
30 inch square piles ..... 36 to 43 inches

For other pile sizes, use the diameter of the drills shown in the Plans or approved by the Engineer. Accurately drill the pile holes with the hole centered over the Plan location of the piling. Maintain the location and vertical alignment within the tolerances allowed for the piling.

For predrilled holes required through rock or other hard (i.e. debris, obstructions, etc.) materials that may damage the pile during installation, predrill hole diameters approximately 2 inches larger than the largest dimension across the pile cross-section. Fill the annular space around the piles as described in 455-5.9.1 with clean A-3 sand or sand meeting the requirements of 902-3.3.

In the setting of permanent and test piling, the Contractor may initially predrill holes to a depth up to 10 feet or 20% of the pile length whichever is greater, except that, where installing piles in compacted fill, predrill the holes to the elevation of the natural ground surface. With prior written authorization from the Engineer, the Contractor may predrill holes to greater depths to minimize the effects of vibrations on existing structures adjacent to the work and/or for other reasons the Contractor proposes. Perform such work the Engineer allows but does not require at no expense to the City. When the Engineer requires such work, the City will pay for such work as Preformed Pile Holes as described in 455-5.9.

455-5.1.2 Underwater Driving: Underwater driving is defined as any driving through water which is above the pile head at the time of driving.

When conducting underwater driving, provide a diver equipped with voice communications to aid in placing the hammer back on the pile for required cushion changes or for subsequent redriving, to attach or recover instrumentation the Engineer is using, to inspect the condition of the pile, or for other assistance as required.

Select one of the following methods for underwater driving:

1. Accomplish underwater driving using conventional driving equipment and piling longer than authorized so that the piling will extend above the water surface during final driving. When choosing this option, furnish a pile hammer that satisfies the requirements of this Section for use with the longer pile.

2. Accomplish underwater driving using an underwater hammer that meets the requirements of this Section and is approved by the Engineer. When choosing this option, provide at least one pile longer than authorized at each pile group, extending above the water surface at final driving. At each group location, drive the longer pile first. The Engineer will evaluate the adequacy of the underwater driving system. The Engineer may use the pile tip elevation of the longer pile that the Contractor has driven and the Engineer has accepted, to evaluate the acceptability of the piles driven with the underwater hammer.

3. Accomplish underwater driving using conventional driving equipment with a suitable approved pile follower. When choosing this option, provide at least one pile longer than

required at each pile group, extending above the water surface at final driving. At each group location, drive the full length pile first without using the follower. The Engineer will evaluate the adequacy of the follower used for underwater driving. The Engineer may choose to perform a dynamic load test on the first pile the Contractor drives with the follower in each group. The Engineer may use the pile tip elevation of the longer pile, that the Contractor has driven and the Engineer has accepted, to evaluate the acceptability of the piles driven with the follower.

Prior to use, submit details of the follower for the Engineer's evaluation and approval along with the information required in 455-10. Include the weight, cross-section details, stiffness, type of materials, and dimensions of the follower.

455-5.2 Pile Hammers: All equipment is subject to satisfactory field performance. Use a variable energy hammer to drive concrete piles. Hammers will be rated based on the theoretical energy of the ram at impact. Supply driving equipment which provides the required resistance at a blow count ranging from 3 blows per inch (36 blows per foot) to 10 blows per inch (120 blows per foot) at the end of initial drive, unless approved otherwise by the Engineer after satisfactory field trial. Ensure the hammer is capable of driving to a resistance equal to at least 2.0 times the factored design load plus the scour and down drag resistance shown in the Contract Documents, without overstressing the piling in compression or tension and without reaching or exceeding 20 blows per inch. When the Engineer determines the stroke height or bounce chamber pressure readings do not adequately determine the energy of the hammer, provide and maintain a device to measure the velocity of the ram at impact. Determine the actual hammer energy in the field so that it is consistent with the hammer energy used for each bearing capacity determination. When requested, submit to the Engineer all technical specifications and operating instructions related to hammer equipment.

455-5.2.1 Air/steam: Variable energy air/steam hammers shall be capable of providing at least two ram stroke lengths. The short ram stroke length shall be approximately half of the full stroke for hammers with strokes up to 4 feet and no more than 2 feet for hammers with maximum strokes lengths over 4 feet. Operate and maintain air/steam hammers within the manufacturer's specified ranges. Use a plant and equipment for steam and air hammers with sufficient capacity to maintain, under working conditions, the hammer, volume and pressure specified by the manufacturer. Equip the plant and equipment with accurate pressure gauges which are easily accessible to the Engineer. The Engineer will not accept final bearing on piles the Contractor drives with air/steam hammers unless the Contractor operates the hammers within 10% of the manufacturer's rated speed in blows per minute, unless otherwise authorized by the
Engineer.

455-5.2.2 Diesel: Variable energy diesel hammers shall have at least three fuel settings that will produce reduced strokes. Operate and maintain diesel hammers within the manufacturer's specified ranges. Determine the rated energy of diesel hammers using measured ram stroke length multiplied by the weight of the ram for open end hammers and by methods recommended by the manufacturer for closed end hammers.

Submit to the Engineer a chart from the hammer manufacturer equating stroke and blows per minute for the open-end diesel hammer to be used. Also provide and maintain in working order for the Engineer's use an approved device to automatically determine and display ram stroke for open-end diesel hammers.

Equip closed-end (double acting) diesel hammers with a bounce chamber pressure gauge, in good working order, mounted near ground level so the Engineer can easily read. Also, submit to the Engineer a chart, calibrated to actual hammer performance within 30 days prior to initial use, equating bounce chamber pressure to either equivalent energy or stroke for the closed-end diesel hammer to be used.

455-5.2.3 Hydraulic: Variable energy hydraulic hammers shall have at least three hydraulic control settings that provide for predictable energy or equivalent ram stroke. The shortest

stroke shall be a maximum of 2 feet for the driving of concrete piles. The remaining strokes shall include full stroke and approximately halfway between minimum and maximum stroke.

Supply hammer instrumentation with electronic read out, and control unit that allows the operator to read and adjust the hammer energy or equivalent ram stroke. When pressure measuring equipment is required to determine hammer energy, calibrate the pressure measuring equipment before use.

455-5.2.4 Vibratory: Vibratory hammers of sufficient capacity (force and amplitude) may be used to drive steel sheet piles and, with approval of the Engineer, to drive steel bearing piles a sufficient distance to get the impact hammer on the pile (to stick the pile). The Engineer will determine the allowable depth of driving using the vibratory hammer based on site conditions. However, in all cases, use a power impact hammer for the last 15 feet or more of the final driving of steel bearing piles for bearing determinations after all piles in the bent/pier have been driven with a vibratory hammer. Do not use vibrating hammers to install concrete piles, or to install support or reaction piles for a load test.

455-5.3 Cushions and Pile Helmet:

455-5.3.1 Capblock: Provide a capblock (also called the hammer cushion) as recommended by the hammer manufacturer. Use commercially manufactured capblocks constructed of durable manmade materials with uniform known properties. Do not use wood chips, wood blocks, rope, or other material which permit excessive loss of hammer energy. Do not use capblocks constructed of asbestos materials. Obtain the Engineer's approval for all proposed capblock materials and proposed thickness for use. Maintain capblocks in good condition, and change them when charred, melted, or otherwise significantly deteriorated. The Engineer will inspect the capblock before driving begins and weekly or at appropriate intervals determined by the Engineer based on field trial. Replace or repair any hammer cushion which loses more than 25% of its original thickness, in accordance with the manufacturer's instructions, before permitting further driving.

455-5.3.2 Pile Cushion: Provide a pile cushion that is adequate to protect the pile from being overstressed in compression and tension during driving. Use a pile cushion sized so that it will fully fill the lateral dimensions of the pile helmet minus one inch but does not cover any void or hole extending through the top of the pile. Determine the thickness based upon the hammer-pile-soil system. For driving concrete piles, use a pile cushion made from pine plywood or oak lumber. Alternative materials may be used with the approval of the Engineer. Obtain the Engineer's approval for all pile cushions. Do not use materials previously soaked, saturated or treated with oil. Maintain pile cushions in good condition and change when charred, splintered, excessively compressed, or otherwise deteriorated to the point it will not protect the pile against overstressing in tension and/or compression. Protect cushions from the weather, and keep them dry. Do not soak the cushions in any liquid. Replace the pile cushion, if during the driving of any pile, the cushion is either compressed more than one-half the original thickness or begins to burn. Provide a new cushion for each pile unless approved otherwise by the Engineer after satisfactory field trial.

Reuse pile cushions in good condition to perform all set-checks and redrives. Use the same cushion to perform the set-check or redrive as was used during the initial driving, unless this cushion is unacceptable due to deterioration, in which case use a similar cushion.

455-5.3.3 Pile Helmet: Provide a pile helmet suitable for the type and size of piling being driven. Use a pile helmet deep enough to adequately contain the required thickness of pile cushion and to assist in maintaining pile-hammer alignment. Use a pile helmet that fits loosely over the pile head and is at least 1 inch larger than the pile dimensions. Use a pile helmet designed so that it will not restrain the pile from rotating.

455-5.4 Leads: Provide pile leads constructed in a manner which offers freedom of movement to the hammer and that have the strength and rigidity to hold the hammer and pile in the correct position and alignment during driving. When using followers, use leads that are long enough and suitable to maintain position and alignment of the hammer, follower, and pile throughout driving.

455-5.5 Followers: Use followers only for underwater driving. Obtain the Engineer's approval for the type of follower, when used, and the method of connection to the leads and pile. Use followers constructed of steel with an adequate cross-section to withstand driving stresses. When driving concrete piles, ensure that the cross-sectional area of the follower is at least 18% of the cross-sectional area of the pile. When driving steel piles, ensure that the cross-sectional area of the follower is greater than or equal to the cross-sectional area of the pile. Provide a pile helmet at the lower end of the follower sized according to the requirements of 455-5.3.3. Use followers constructed that maintain the alignment of the pile, follower, and hammer and still allow the pile to be driven within the allowable tolerances. Use followers designed with guides adapted to the leads that maintain the hammer, follower, and the piles in alignment.

Use information from driving full length piles described in 455-5.1.2 compared to driving piles with the follower and/or dynamic load tests described in 455-5.13 to evaluate the adequacy of the follower and to establish the blow count criteria when using the follower.

455-5.6 Templates and Ground Elevations: Provide a fixed template, adequate to maintain the pile in proper position and alignment during driving with swinging leads or with semi-fixed leads. Where practical, place the template so that the pile can be driven to cut-off elevation before removing the template. Ensure that templates do not restrict the vertical movement of the pile.

Supply a stable reference close to the pile, which is satisfactory in the opinion of the Engineer, for determination of the pile penetration. At the time of driving piles, furnish the Engineer with elevations of the original ground and template at each pile or pile group location. Note the highest and lowest elevation at each required location and the ground elevation at all piles.

455-5.7 Water Jets: Use jet pumps, supply lines, and jet pipes that provide adequate pressure and volume of water to freely erode the soil. Do not perform jetting without prior approval by the Engineer or unless allowed by the Plans.

Do not perform jetting in the embankment or for end bents. Where conditions warrant, with approval by the Engineer, perform jetting on the holes first, place the pile therein, then drive the pile to secure the last few feet of penetration. Only use one jet for prejetting or jetting through piles constructed with a center jet-hole. Use two jets when using external jets. When jetting and driving, position the jets slightly behind the advancing pile tip (approximately 3 feet or as approved by the Engineer). When using water jets in the driving, determine the pile bearing only from the results of driving after withdrawing the jets, except where using jets to continuously eliminate soil resistance through the scour zone, ensure that they remain in place as directed by the Engineer and operating during pile bearing determination. Where practical, perform jetting on all piles in a pile group before driving begins. When large pile groups or pile spacing and batter make this impractical, or when the Plans specify a jet-drive sequence, set check a sufficient number of previously driven piles in a pile group to confirm their capacity after completing all jetting.

455-5.8 Penetration Requirements: Measure the penetration of piles from the elevation of natural ground, scour elevation shown in the Plans, or the bottom of excavation, whichever is lower. When the Contract Documents show a minimum pile tip elevation or a minimum depth of penetration, drive the tip of the pile to this minimum elevation or this minimum penetration depth. In all such cases, the Engineer will accept the bearing of a pile only if the Contractor achieves the required bearing when the tip of the pile is at or below the specified minimum tip elevation or depth of penetration and below the bottom of the preformed or predrilled pile hole.

When the Plans do not show a minimum depth of penetration, scour elevation, or minimum tip elevation, ensure that the required penetration is at least 10 feet into firm bearing material or at least 20 feet into soft material unless otherwise permitted by the Engineer. If a scour elevation is shown in the Plans, achieve these penetrations below the scour elevation. The Engineer may accept a penetration between 15 feet and 20 feet when there is an accumulation of five consecutive feet or more of firm bearing material. Firm bearing material is any material offering a

driving resistance greater than or equal to 30 tons per square foot of gross pile area as determined by the Dynamic Load Testing (455-5.11.4). Soft material is any material offering less than these resistances. The gross pile area is the actual pile tip cross-sectional area for solid concrete piles, the product of the width and depth for H piles, and the area within the outside perimeter for pipe piles and voided concrete piles.

Do not drive piles beyond practical refusal. To meet the requirements in this Subarticle, provide penetration aids, such as jetting or preformed pile holes, when piles cannot be driven to the required penetration without reaching practical refusal.

If the Contractor encounters unforeseeable, isolated obstructions that the Contractor cannot practically penetrate by driving, jetting, or preformed pile holes, and the Contractor must remove the pile to obtain the required pile penetration, the City will pay the costs for such removal as Unforeseeable Work.

455-5.9 Preformed Pile Holes:

455-5.9.1 Description: Preformed pile holes serve as a penetration aid when all other pile installation methods fail to produce the desired penetration and when authorized by the Engineer to minimize the effects of vibrations on adjacent structures. Preformed pile holes are necessary when the presence of rock or strong strata of soils will not permit the installation of piles to the desired penetration by driving or a combination of jetting and driving, when determined necessary by the Engineer, or when authorized by the Engineer to minimize the effects of vibrations on adjacent existing structures. The Engineer may require preformed holes for any type of pile. Drive all piles installed in preformed pile holes to determine that the bearing requirements have been met.

For preformed holes which are required through material that caves during driving to the extent that the preformed hole does not serve its intended purpose, case the hole from the surface through caving material. After installing the pile to the bottom of the casing, remove the casings unless shown otherwise in the Plans. Determine bearing of the pile after removing the casing unless shown otherwise in the Plans. Fill all voids between the pile and soil remaining after driving through preformed holes with clean A-3 sand or sand meeting the requirements of 902-3.3, after the pile has achieved the required minimum tip elevation, unless grouting of preformed pile holes is shown in the Plans. If pile driving is interrupted during sand placement, drive the pile at least 20 additional blows after filling all of the voids between the pile and soil with sand at no additional compensation.

455-5.9.2 Provisions for Use of Preformed Pile Holes: The City generally anticipates the necessity for preformed pile holes and includes directions in the Contract Documents. The City will pay for preformed pile holes when the Contractor establishes that the required results cannot be obtained when driving the load bearing piles with specified driving equipment, or if jetting is allowed, while jetting the piles and then driving or while jetting the piles during driving.

455-5.9.3 Conditions Under Which Payment Will Be Made: The City will make payment for preformed pile holes shown in the Plans, required by the Engineer or where the Contractor demonstrates that such work is necessary to achieve the required penetration of the pile. The City considers, but does not limit to, the following conditions as reasons for preformed pile holes:

1. Inability to drive piles to the required penetration with driving and jetting equipment.
2. To penetrate a hard layer or layers of rock or strong stratum that the Engineer considers not sufficiently thick to support the structure.
3. To obtain greater penetration into dense (strong) material and into dense material containing holes, cavities or unstable soft layers.
4. To obtain penetration into a stratum in which it is desired to found the structure.
5. To minimize the effects of vibrations or heave on adjacent existing structures.
6. To minimize the effects of ground heave on adjacent piles.

455-5.9.4 Construction Methods: Construct preformed pile holes by drilling, or driving and withdrawing a suitable punch or chisel at the locations of the piles. Construct a hole that is equal to or slightly greater than the largest pile dimension for the entire length of the hole and of sufficient depth to obtain the required penetration. Carefully form the preformed hole by using a drill or punch guided by a template or other suitable device, and do not exceed the minimum dimensions necessary to achieve the required penetration of the pile. When the Plans call for grouting the preformed pile holes, provide the minimum dimension of the pile hole that is 2 inches larger than the largest pile dimension. Construct the holes at the Plan position of the pile and the tolerances in location, and ensure the hole is straight and that the batter is the same as specified for the pile. Loose material may remain in the preformed pile hole if the conditions in 455-5.9.3 are satisfied.

455-5.9.5 Grouting of Pile Holes: Grout preformed pile holes for bearing piles, when the Plans require grouting after driving. Clean the preformed pile holes, and fill them with cement grout as shown in the Plans. Use grout that has a minimum compressive strength of 3,000 psi at 28 days or as specified. Pump the grout through three or more grout pipes initially placed at the bottom of the preformed hole. The Contractor may raise the grout pipes when necessary to prevent clogging and to complete the grouting operations. Maintain the grout pipes below the surface of the previously placed grout. Continue grouting until the grout reaches the ground surface all around the pile. Provide divers to monitor grouting operations when the water depth is such that it is impractical to monitor from the ground surface. When grouting is shown in the Plans, include the cost in the price for piles. In the event that the Engineer determines the Contractor must grout and the required grouting is not shown in the Plans, the City will pay for the grouting work as Unforeseeable Work.

455-5.10 Bearing Requirements:

455-5.10.1 General: Drive piles to provide the bearing required for carrying the loads shown in the Plans. For all types of bearing piles, consider the driving resistance as determined by the methods described herein sufficient for carrying the specified loads as the minimum bearing which is accepted for any type of piles. Determine pile bearing using the method described herein or as shown in the Plans.

For foundations requiring 100% dynamic testing of production piles, the Engineer may accept a driven pile when the pile has achieved minimum penetration and the minimum required bearing obtained for 6 inches of consecutive driving, or when the minimum penetration is achieved, driving has reached practical refusal in firm material and the bearing capacity is obtained in all the refusal blows.

For foundations not requiring 100% dynamic testing of production piles, the Engineer may accept a driven pile when the pile has achieved minimum penetration, the blow count is generally the same or increasing and the minimum required bearing capacity obtained for 24 inches of consecutive driving. At his discretion, the Engineer may also accept a driven pile when the minimum penetration is achieved and driving has reached practical refusal in firm material.

455-5.10.2 Bearing Criteria: For foundations requiring 100% dynamic testing, the Engineer will determine the bearing of all piles using the data received from dynamic load testing equipment utilizing internally or externally mounted sensors according to the methods described in 455-5.11.1.

For foundations not requiring 100% dynamic testing, the Engineer will determine the number of blows required to provide the required bearing according to the methods described herein. Determine the pile bearing by computing the penetration per blow with less than 1/4 inches rebound averaged through 12 inches each of penetration. When it is considered necessary by the Engineer, determine the average penetration per blow by averaging the penetration per blow through the last 10 to 20 blows of the hammer.

455-5.10.3 Practical Refusal: Practical refusal is defined as 20 blows per inch or less than one inch penetration, with the hammer operating at the highest setting determined by the Engineer and less than 1/4 inches rebound per blow. Stop driving as soon as the Engineer determines that the pile has reached practical refusal.

455-5.10.4 Set-checks and Pile Redrive:

1. Set-checks: In the event that the Contractor has driven the pile to approximately 12 inches above cut-off without reaching the required resistance, the Engineer may require the Contractor to interrupt driving to perform a set-check. Provide an engineer's level or other suitable equipment for elevation determinations to determine accurate pile penetration during the set-checks. In the event the results of the initial set-checks are not satisfactory, the Engineer may direct additional set-checks. The Engineer may accept the pile as driven when a set-check shows that the Contractor has achieved the minimum required pile bearing and has met all other requirements of this Section.

2. Pile Redrive: Pile redrive consists of redriving the pile after the following working day from initial driving to determine time effects, to reestablish pile capacity due to pile heave, or for other reasons determined by the Engineer. Redrive piles as directed by the Engineer.

3. Uninstrumented Set-Checks and Uninstrumented Pile Redrive: The Engineer may consider the pile to have sufficient bearing resistance when the specified set-check criteria is met through the last 10 to 20 blows of the hammer at the specified minimum stroke and the total penetration is less than six inches with less than 1/4 inches rebound per blow. When the total penetration during a set-check or redrive is greater than six inches or pile rebound exceeds 1/4 inches per blow, the Engineer may consider the pile to have sufficient bearing resistance when the specified blow count criteria is achieved in accordance with 455-5.10.1.

4. Instrumented Set-Checks and Instrumented Pile Redrive: When considered necessary by the Engineer, dynamic load tests using at least 6 hammer blows will determine whether the pile bearing is sufficient. The Engineer may consider the pile to have sufficient bearing resistance when dynamic measurements demonstrate the static pile resistance when at least one hammer blow exceeds the required pile resistance and the average static pile resistance during the next five hammer blows exceeds 95% of the required pile resistance. If the pile is advanced farther, the static pile resistance during all subsequent blows must exceed 90% of the required pile resistance.

455-5.10.5 Pile Heave: Pile heave is the upward movement of a pile from its originally driven elevation. Drive the piles in an approved sequence to minimize the effects of heave and lateral displacement of the ground. Monitor piles previously driven in a pile group for possible heave during the driving of the remaining piles. When required by the Engineer, take elevation measurements to determine the magnitude of the movement of piles and the ground surface resulting from the driving process. Redrive all piles that have heaved 1/4 inches or more unless the Engineer determines that the heave is not detrimental to pile capacity. The City will pay for all work in conjunction with redriving piles due to pile heave under the pile redrive item.

455-5.10.6 Piles with Insufficient Bearing: In the case that the Engineer determines that the safe bearing capacity of any pile is less than the required bearing capacity,
the Contractor may splice the pile and continue driving or may extract the pile and drive a pile of greater length, or, if so ordered by the Engineer, drive additional piles until reducing the required bearing per pile to the determined bearing capacity of the piles already driven.

455-5.11 Methods to Determine Pile Capacity:

455-5.11.1 General: Dynamic load tests using internal gauges or an externally mounted instrument system and signal matching analyses will be used to determine pile capacity for all structures or projects unless otherwise shown on the Plans. When necessary, the Engineer may require static load tests to confirm pile capacities. When the Contract Documents do not include items for static load tests, the Engineer will consider all required static load testing Unforeseeable Work. Notify the Engineer two working days prior to placement of piles within the template and at least one working day prior to driving piles. Do not drive piles without the presence of the Engineer.

If the internally mounted system fails to communicate properly with the receiving system, allow the Engineer sufficient time to mobilize back-up equipment for performing dynamic load testing.

455-5.11.2 Wave Equation:

1. General: Use Wave Equation Analysis for Piles (WEAP) programs to evaluate the suitability of the proposed driving system (including the hammer, follower, capblock and pile cushions) as well as to estimate the driving resistance, in blows per 12 inches or blows per inch, to achieve the pile bearing requirements and to evaluate pile driving stresses.

The Engineer may modify the scour resistance shown in the Plans if the dynamic load test is used to determine the actual soil resistance through the scour zone. Also, the Engineer may make modifications in scour resistance when the Contractor proposes drilling and/or jetting to reduce the soil resistance in the scour zone.

Use Wave Equation Analyses to show the hammer meets the requirements described in 455-5.2.

2. Required Equipment For Driving: Hammer approval is solely based on satisfactory field trial including dynamic load test results and Wave Equation Analysis. Supply a hammer system that meets the requirements described in the specifications based on the above analysis. Obtain approval from the Engineer for the pile driving system based on satisfactory field performance.

In the event piles require different hammer sizes, the Contractor may elect to drive with more than one size hammer or with a variable energy hammer, provided the hammer is properly sized and cushioned, will not damage the pile, and will develop the required resistance.

3. Maximum Allowed Pile Stresses:

a. General: The maximum allowed driving stresses for concrete, steel, and timber piles are given below. In the event Wave Equation analyses show that the hammer will overstress the pile, modify the driving system or method of operation as required to prevent overstressing the pile. In such cases provide additional cushioning or make other appropriate agreed upon changes. For penetration of weak soils by concrete piles, use thick cushions and/or reduced stroke to control tension stresses during driving.

b. Concrete Piles: Use the wave equation to evaluate the proposed pile cushioning. Use the following equations to determine the maximum allowed pile stresses as predicted by the wave equation, and measured during driving when driving prestressed concrete piling:

$$s_{apc} = 0.7f_c' - 0.75f_{pe} \qquad (1)$$

$$s_{apt} = 6.5(f_c')^{0.5} - 1.05f_{pe} \qquad \text{(2a) for piles less than 50 feet long}$$

$$s_{apt} = 3.25(f_c')^{0.5} - 1.05f_{pe} \qquad \text{(2b) for piles 50 feet long and greater}$$

$$s_{apt} = 500 \qquad \text{(2c) within 20 feet of a mechanical splice}$$

where:

s_{apc}= maximum allowed pile compressive stress, psi

s_{apt}= maximum allowed pile tensile stress, psi

f'_c= specified minimum compressive strength of concrete, psi

f_{pe}= effective prestress (after all losses) at the time of driving, psi, taken as0.8 times the initial prestress force (f_{pe}= 0 for dowel spliced piles).

c. Steel Piles: Ensure the maximum pile compression and tensile stresses as predicted by the Wave Equation, and/or measured during driving are no greater than 0.9 times the yield strength (0.9 f_y) of the steel.

d. Timber Piles: Ensure the maximum pile compression and tensile stresses as predicted by the wave equation, and/or measured during driving are no greater than

3.6 ksi for Southern Pine and Pacific Coast Douglas Fir and 0.9 of the ultimate parallel to the grain strength for piles of other wood.

455-5.11.3 Temporary Piles: Submit for the Engineers review, an analysis signed and sealed by a Specialty Engineer which establishes the pile lengths for temporary piles, and submit for the Engineers approval, a Wave Equation analysis signed and sealed by a Specialty Engineer which establishes the driving criteria for temporary piles at least five working days prior to driving temporary production piles. The required driving resistance is equal to the sum of the factored design load plus the scour and down drag resistances shown in the Plans, divided by the appropriate resistance factor or the nominal bearing resistance shown in the Plans, whichever is higher.

The maximum resistance factor is 0.45 when only wave equation analysis is performed. However, a larger resistance factor may be applicable when additional testing is provided by the Specialty Engineer in accordance with Section 3.5.6 of Volume 1 of the FDOT Structures Manual.

455-5.11.4 Dynamic Load Tests: Dynamic load testing consists of estimating pile capacity by the analysis of electronic data collected from blows of the hammer during driving of an instrumented pile.

455-5.11.5 Static Load Tests: Static load testing consists of applying a static load to the pile to determine its capacity. Use The Modified Quick Test Procedure in accordance with 455-2.2.1.

455-5.11.6 Fender Pile Installation: For piles used in fender systems, regardless of type or size of pile, either drive them full length or jet the piles to within 2 feet of cutoff and drive to cutoff elevation to seat the pile. The Engineer will not require a specific driving resistance unless noted in the Plans. Use methods and equipment for installation that do not damage the piles. If the method or equipment used causes damage to the pile, modify the methods or equipment at no expense to the City.

455-5.11.7 Structures Without Test Piles: For structures without test piles or 100% dynamic testing, the Engineer will dynamically test the first pile(s) in each bent or pier at locations shown in the Plans to determine the blow count criteria for the remaining piles. When locations are not shown in the Plans, allow for dynamic load tests at 5% of the piles at each bent or pier (rounded up to the next whole number). If the Engineer requires additional dynamic load tests for comparison purposes, the Contractor will be paid for an additional dynamic load test as authorized by the Engineer in accordance with 455-11.5.

Allow the Engineer one working day after driving the dynamic load tested piles for the Engineer to complete the signal matching analyses and determine the driving criteria for the subsequent piles in the bent or pier.

455-5.12 Test Piles:

455-5.12.1 Description: Drive piles of the same cross-section and type as the permanent piles shown in the Plans, in order to determine any or all of the following:

1. the installation criteria for the piles.
2. the nature of the soil.
3. the lengths of permanent piles required for the work.
4. the driving resistance characteristics of the various soil strata.
5. the amount of work necessary to obtain minimum required pile penetration.
6. the ability of the driving system to do the work.
7. the need for point protection.

Because test piles are exploratory in nature, drive them harder (within the limits of practical refusal), deeper, and to a greater bearing resistance than required for the permanent piling. Except for test piles which are to be statically or Statnamically load tested, drive test piles their full length or to practical refusal. Splice test piles which have been driven their full length and have developed only minimal required bearing, and proceed with further driving.

As a minimum, unless otherwise directed by the Engineer, do not cease driving of test piles until obtaining the required bearing capacity continuously, where the blow count is increasing, for 10 feet unless reaching practical refusal first. For test piles which are to be statically or Statnamically load tested, ignore this minimum and drive these piles as anticipated for the production piles.

When test piles attain practical refusal prior to attaining minimum penetration, perform all work necessary to attain minimum penetration and the required bearing. Where practical, use water jets to break the pile loose for further driving. Where jetting is impractical, extract the pile and install a preformed pile hole through which driving will continue. The City will consider the work of extracting the pile to be Unforeseeable Work.

When driving test piles other than low displacement steel test piles, have preforming equipment available at the site and water jets as specified in 455-5.7 when jetting is allowed, ready for use, before the test pile driving begins.

The Engineer may elect to interrupt pile driving up to four times on each test pile, two times for up to two hours and two additional times during the next working day of initial driving to determine time effects during the driving of test piles.

Install instruments on test piles when dynamic load tests are included in the Plans or when directed by the Engineer.

455-5.12.2 Location of Test Piles: Drive all test piles in the position of permanent piles at the designated locations. Ensure that all test piles designated to be statically load tested are plumb. In the event that all the piles are battered at a static load test site, the Engineer will designate an out-of-position location for driving a plumb pile for the static load test.

455-5.12.3 Equipment for Driving: Use the same hammer and equipment for driving test piles as for driving the permanent piles. Also use the same equipment to redrive piles.

455-5.13 Dynamic Load Tests: The Engineer will take dynamic measurements during the driving of piles designated in the Plans or authorized by the Engineer. Install instruments prior to driving and assist the Engineer in monitoring all blows delivered to the pile. All test piles will have dynamic load tests. The Engineer will perform dynamic load tests to evaluate any or all of the following:

1. Evaluate suitability of Contractor's driving equipment, including hammer, capblock, pile cushion, and any proposed follower.
2. Determine pile capacity.
3. Determine pile stresses.
4. Determine energy transfer to pile.
5. Determine distribution of soil resistance.
6. Evaluate soil variables including quake and damping.
7. Evaluate hammer-pile-soil system for Wave Equation analyses.
8. Evaluate pile installation problems.
9. Other.

Either install internal gauges in the piles in accordance with Design Standards, Index No. 20602 or attach instruments (strain transducers to measure force and accelerometers to measure acceleration) with bolts to the pile for dynamic load testing.

Make each pile to be dynamically tested with externally attached instruments available to drill holes for attaching instrumentation and for wave speed measurements. Support the pile with timber blocks placed at appropriate intervals. Ensure that the pile is in a horizontal position and does not contact adjacent piles. Provide a sufficient clear distance at the sides of the pile for drilling the holes. The Engineer will furnish the equipment, materials, and labor necessary for drilling holes and taking the wave speed measurements. If the Engineer directs dynamic load testing, instrumented set-

checks or instrumented redrives, provide the Engineer safe access to the top of the piles for drilling the attachment holes. After placing the leads
provide the Engineer reasonable means of access to the piles to attach the instruments and for removal of the instruments after completing the pile driving.

The Engineer will monitor the stresses in the piles with the dynamic test equipment during driving to ensure the Contractor does not exceed the maximum allowed stresses. If necessary, add additional cushioning, replace the cushions, or reduce the hammer stroke to maintain stresses below the maximum allowable. If dynamic test equipment measurements indicate non-axial driving, immediately realign the driving system. If the cushion
is compressed to the point that a change in alignment of the hammer will not correct the problem, add cushioning or change the cushion as directed by the Engineer.

Drive the pile to the required penetration and resistance or as directed by the Engineer. Dynamic load testing of a pile may average up to two hours longer than for driving an uninstrumented pile.

When directed by the Engineer, perform instrumented set-checks or redrives. Do not use a cold diesel hammer for a set-check or redrive unless in the opinion of the Engineer it is
impractical to do otherwise. Generally, warm up the hammer by driving another pile or applying at least 20 blows to a previously driven pile or to timber mats placed on the ground.

For steel production piles, the Engineer may accept instrumented set-checks or redrives for the purpose of meeting the requirements for 100% dynamic testing.

455-5.14 Pile Lengths:

455-5.14.1 Test Pile Length: Provide the length of test piles shown in the Plans or as directed by the Engineer.

455-5.14.2 Production Pile Length

455-5.14.2.1 Structures With Test Piles: When test pile lengths are shown in the Plans, the production pile lengths are based on information available during design and are approximate only. The Engineer will determine final pile lengths in the field which may vary significantly from the lengths or quantities shown in the Plans.

455-5.14.2.2 Structures Without Test Piles: Authorized lengths are provided as Production Pile Order Lengths in the Pile Data Table in the Structure Plans. Use these lengths for furnishing the permanent piling for the structure.

455-5.14.3 Authorized Pile Lengths: The authorized pile lengths are the lengths determined by the Engineer based on all information available before the driving of the permanent piles, including, but not limited to, information gained from the driving of test piles, dynamic load testing, static load testing, supplemental soil testing, etc. When authorized by the City, soil freeze information obtained during set checks and pile redrives may be used to determine authorized pile lengths for sites with extreme soil conditions. The Contractor may elect to provide piling with lengths longer than authorized to suit his method of installation or schedule. When the Contractor elects to provide longer than authorized pile lengths, the City will pay for the furnished length as either the originally authorized length or the
length between cut-off elevation and the final accepted pile tip elevation, whichever is the longer length.

Within five working days after driving all the test piles, completing all
load tests, completing all redrives, and receiving all test reports, the Engineer will submit the Contractor an itemized list of authorized pile lengths. Use these lengths for furnishing the permanent piling for the structure. If the Contractor is willing to start his pile driving operations in zones consisting of at least four test piles designated by the Engineer, and if the Contractor so requests in writing at the beginning of the test pile program, the City will submit pile lengths for these designated phases within five working days after driving all the test piles, completing all load tests, completing all redrives, and

receiving all test reports for those designated zones. The Engineer will submit the driving criteria for piles within three working days of furnishing pile lengths.

On multiple phase projects, the Engineer will not submit pile lengths on subsequent phases until completing the piling on initial phases.

455-5.15 Allowable Driving Tolerances:

455-5.15.1 General: Meet the tolerances described in this Subarticle to the piles that are free standing without lateral restraint (after the template is removed). After the piles are driven, do not move the piles laterally to force them to be within the specified tolerances. The Contractor may move battered piles laterally to overcome the dead load deflections caused by the pile's weight. When this is necessary, submit calculations signed and sealed by a Specialty Engineer to the Engineer that verify the amount of dead load deflection prior to moving any piles.

455-5.15.2 Position: Ensure that the final position of the pile head at cut-off elevation is no more than 3 inches laterally in the X or Y coordinate from the Plan position indicated in the Plans.

455-5.15.3 Axial Alignment: Ensure that the axial alignment of the driven piles does not deviate by more than 1/4 inches per foot from the vertical or batter line indicated in the Plans.

455-5.15.4 Elevation: Ensure that the final elevation of the pile head is no more than 1-1/2 inches above, or more than 4 inches below, the elevation shown in the Plans, however in no case shall the pile be embedded less than 8 inches into the cap or footing.

For fender piles, cut off piles at the elevation shown in the Plans to a tolerance of plus 0.0 inches to minus 2.0 inches using sawing or other means as approved by the Engineer to provide a smooth level cut.

455-5.15.5 Deviation From Above Tolerances: When the Contractor has failed to meet the above tolerances, the Contractor may propose a redesign to incorporate out of tolerance piles into pile caps or footings, at no expense to the City. Ensure the Contractor's Engineer of Record performs any redesign and signs and seals the redesign drawings and computations. Do not begin any proposed construction until the redesign has been reviewed for acceptability and approved by the Engineer.

455-5.16 Disposition of Pile Cut-offs, Test Piles, and Load Test Materials:

455-5.16.1 Pile Cut-offs:

1. Steel Piling: Unless shown otherwise in the Plans, the City will retain ownership of cut-off sections, or portions of cut-off sections, and unused piling 20 feet long or longer that are not damaged. Deliver them to the City's nearest maintenance yard. Ensure that sections of piles delivered to the maintenance yard are straight and undamaged. Cut off the damaged portions prior to delivery. Take ownership of cut-off sections less than 20 feet long. Remove them from the job, and dispose of them.

2. Other Pile Types: Upon completion of all work under the Contract in connection with piling, unless shown otherwise in the Plan, take ownership of any unused cut-off lengths remaining, and remove them from the right-of-way. Provide areas for their disposal.

455-5.16.2 Test Piles: Where so directed by the Plans or the Engineer, cut off, or build-up as necessary, test piles, and leave them in place as permanent piles. Extract and replace test piles driven in permanent position and found not suitable for use due to actions of the Contractor at no expense to the City. Pull, or cut off at an elevation 2 feet below the ground surface or bottom of proposed excavation, test piles driven out of permanent position, and dispose of the removed portion of the test pile.

When test piles are required to be driven in permanent pile positions, the Contractor may elect to drive the test pile out of position, with the approval of the Engineer, provided that a replacement pile is furnished and driven by the Contractor at no expense to the City in the position that was to be occupied by the test pile. Under this option, the City will pay for the test pile in the same manner as if it were in permanent position.

Unless otherwise directed in the Plans or by the Engineer, retain ownership of test piles that are pulled or cut off and provide areas for their disposal.

455-6 Timber Piling.

455-6.1 Description: Drive timber piles constructed of round timber of the kind and dimensions specified in the Plans at the locations and to the elevations shown in the Plans, or as directed by the Engineer.

455-6.2 Materials: Meet the timber piling requirements of Section 953. Treat the piles according to the applicable provisions of Section 955. Treat all cuts and drilled holes in accordance with 470-3.

455-6.3 Preparation for Driving:

455-6.3.1 Caps: Protect the heads of timber piles during driving, using a cap of approved type, that will distribute the hammer blow over the entire cross-section of the pile. When necessary cut the head of the pile square before beginning pile driving.

455-6.3.2 Collars: Provide collars or bands to protect piles against splitting and brooming at no expense to the City.

455-6.3.3 Shoes: Provide piles shod with metal shoes, of a design satisfactory to the Engineer, at no expense to the City. Shape pile tips to receive the shoe and install according to the manufacturer's directions.

455-6.4 Storage and Handling: Store and handle piles in the manner necessary to avoid damage to the piling. Take special care to avoid breaking the surface of treated piles. Do not use cant dogs, hooks, or pike holes when handling and storing the piling.

455-6.5 Cutting Off: Saw off the tops of all timber piles at the elevation indicated in the Plans. Saw off piles which support timber caps to the exact plane of the superimposed structure so that they exactly fit it. Withdraw and replace broken, split, or misplaced piles.

455-6.6 Build-ups: The Engineer will not permit splices or build-ups for timber piles. Extract piles driven below Plan elevation and drive a longer pile.

455-6.7 Pile Heads:

455-6.7.1 Piles with Timber Caps: On piles wider than the timber caps, dress off to a slope of 45 degrees the part of the pile head projecting beyond the sides of the cap. Coat the cut surface with the required preservative over which place a sheet of copper, of a weight of 10 ounces per square foot or greater, meeting the requirements of ASTM B370. Provide a cover measuring at least 4 inches more in each dimension greater than the diameter of the pile. Bend the cover down over the pile and fasten the edges with large head copper nails or three wraps of No. 12 copper wire.

455-6.7.2 Fender and Bulkhead Piles: First paint the heads of fender piles and of bulkhead piles with preservative and then cover with copper as provided above for piles supporting timber caps.

455-7 Prestressed Concrete Piling.

455-7.1 Description: Provide prestressed concrete piles that are manufactured, cured, and driven in accordance with the requirements of the Contract Documents. Provide piles full length without splices when transported by barge or the pile length is less than or equal to 120 feet. When piles are transported by truck and the pile length exceeds 120 feet but is less than the maximum length for a three point pick-up according to Design Standards, Index No. 20600, and splicing is desired, provide minimal splices. Include the cost of the splices in the cost of the pile.

455-7.2 Manufacture: Fabricate piles in accordance with Section 450. When internal gauges will be used for dynamic load testing, supply and install in square prestressed concrete piles in accordance with Design Standards, Index No 20602. Ensure the internal gauges are installed by personnel approved by the manufacturer.

455-7.3 Storage and Handling:

455-7.3.1 Time of Driving Piles: Drive prestressed concrete piles at any time after the concrete has been cured in accordance with Section 450, and the concrete compressive strength is equal to or greater than the specified 28 day compressive strength.

455-7.3.2 Storage: Support piles on adequate dunnage both in the prestress yard and at the job site in accordance with the locations shown in the Standard Indexes to minimize undue bending stresses or creating a sweep or camber in the pile.

455-7.3.3 Handling: Handle and store piles in the manner necessary to eliminate the danger of fracture by impact or of undue bending stresses in handling or transporting the piles from the forms and into the leads. In general, lift concrete piles by means of a suitable bridge or slings attached to the pile at the locations shown in the Standard Indexes. Construct slings used to handle piles of a fabric material or braided wire rope constructed of six or more wire ropes which will not mar the corners or the surface finish of the piles. Do not use chains to handle piles. During transport, support concrete piles at the lifting locations shown in the
Standard Indexes or fully support them throughout 80% or more of their length. In handling piles for use in salty or brackish water, exercise special care to avoid damaging the surface and
corners of the pile. If an alternate transportation support arrangement is desired, submit calculations, signed and sealed by the Specialty Engineer, for approval by the Engineer prior to transporting the pile. Calculations must show that the pile can be transported without exceeding the bending moments calculated using the support locations shown in the Plans.

455-7.4 Cracked Piles: The Engineer will reject any pile that becomes cracked in handling to the point that a transverse or longitudinal crack extends through the pile, shows failure of the concrete as indicated by spalling of concrete on the main body of the pile adjacent to the crack, or which in the opinion of the Engineer will not withstand driving stresses. The Engineer will not reject any pile for the occasional minor surface hairline cracking caused by shrinkage or tensile stress in the concrete from handling.

Do not drive piling with irreparable damage, which is defined as any cracks that extend through the pile cross-sectional area that are, or will be, below ground or water level at the end of driving. Such cracks are normally evidenced by emitting concrete dust during their opening and closing with each hammer blow. Remove and replace broken piles or piles cracked to the extent described above at no expense to the City. The Engineer will accept cracks less than 0.005 inches which do not extend through the pile. Using approved methods, cut off and splice or build-up to cut-off elevation piles with cracks greater than 0.005 inches at the pile head or above ground or water level, and piles with cracks above ground or water level which extend through the cross-sectional area of the pile. The Engineer, at his discretion, may require correction of pile damage or pile cracks by cutting down the concrete to the plane of sound concrete below the crack and rebuilding it to cut-off elevation, or the Engineer may reject the pile. Extract and replace rejected piles that cannot be repaired, at no expense to the City.

Take appropriate steps to prevent the occurrence of cracking, whether due to handling or driving. When cracking occurs during driving, take immediate steps to prevent additional cracking by using thicker cushions or reducing the ram stroke length. Revise handling and transporting equipment and procedures as necessary to prevent cracking during handling and transportation.

455-7.5 Preparation for Transportation: Cut any strands protruding beyond the ends of the pile flush with the surface of the concrete using an abrasive cutting blade before transporting the piles from the casting yard.

Cut and patch the metal lifting devices in accordance with 450-9.2.1.

455-7.6 Method of Driving: Unless otherwise directed, drive piles by a hammer or by means of a combination of water jets and hammer when jetting is allowed. When using jets in combination with a hammer, withdraw the jets and drive the pile by the hammer alone to secure final penetration and to

rigidly fix the tip end of the pile. Keep jets in place if they are being used to continuously eliminate the soil resistance in the scour zone.

455-7.7 Extensions and Build-ups Used to Increase Production Lengths:

455-7.7.1 General: Where splices and build-ups for concrete piles are necessary, construct splices and build-ups in accordance with Design Standards, Index No. 20601.

These requirements are not applicable to specially designed piling. Make splices for special pile designs as shown in the Plans.

455-7.7.2 Extensions to be Driven or Those 21 feet or Longer: Construct extensions to be driven or extensions 21 feet or longer in length in accordance with the details shown in the Plans and in a manner including the requirements, sequences, and procedures outlined below:

1. Cast a splice section in accordance with Section 450 with the dowel steel in the correct position and alignment.

2. Drill dowel holes using an approved steel template that will position and align the drill bit during drilling. Drill holes a minimum of 2 inches deeper than the length of the dowel to be inserted.

3. Clean the drilled dowel holes by inserting a high pressure air hose to the bottom of the hole and blowing the hole clean from the bottom upward. Eliminate any oil, dust, water, and other deleterious materials from the holes and the concrete surfaces to be joined.

4. Place forms around joints between the pile sections.

5. Mix the adhesive components in accordance with the manufacturer's directions. Do not mix sand or any other filler material with the epoxy components unless it is prepackaged by the manufacturer for this specific purpose. Use adhesives meeting the requirements of Section 926 for Type B Epoxy Compounds.

6. After ensuring that all concrete surfaces are dry, fill the dowel holes with the adhesive material.

7. Insert the dowels of the spliced section into the adhesive filled holes of the bottom section and position the spliced section so that the axes of the two sections are in concentric alignment and the ends of the abutting sections are spaced 1/2 inches apart. The Contractor may use small steel spacers of the required thickness provided they have 3 inches or more of cover after completing the splice. Fill the space between the abutting sections completely with the adhesive.

8. Secure the spliced sections in alignment until the adhesive is cured in accordance with the manufacturer's directions for the time appropriate with the prevailing ambient temperatures. Do not utilize the crane to secure the pile extension during the adhesive cure time. Utilize alignment braces to maintain the proper pile alignment during the epoxy cure time.

9. After curing is completed, remove alignment braces and forms and clean and dress the spliced area to match the pile dimensions.

When dowel splices need to be driven, assist the Engineer in performing dynamic instrumentation during the driving of each dowel spliced pile to monitor and control the stresses and verify the splicing integrity. Replace any damaged pile splices in accordance with 455-11.2.7. Provide the Engineer 48 hours advance notification prior to driving spliced piles.

455-7.7.3 Precast Reinforced Build-ups: Construct precast reinforced build-ups in accordance with the requirements of this Subarticle, Section 346, and Section 400. Provide the same material for the form surfaces for precast build-ups as was used to form the prestressed piles. Use concrete of the same mix as used in the prestressed pile and dimension the cross- section the same as piling being built up. Install build-ups as specified in 455-7.7.2(2) through 455-7.7.2(9). Apply to the build-ups the same surface treatment or sealant applied to the prestressed piles.

455-7.8 Pre-Planned Splices: Splices shall be made by the doweled splice method contained in the Standard Indexes or may be made using proprietary splices which are listed on the City's Approved

Product List (APL). Splice test piles in the same manner as the production piles. Include in the pile installation plan, the chosen method of splicing and the approximate locations of the splice. Generally, place the splice at approximately the midpoint between the estimated pile tip and the ground surface, considering scour if applicable. Stagger the splice location between adjacent piles by a minimum of 10 feet. Obtain the Engineer's approval prior to constructing any pile sections. Construct piles which are to be spliced using the doweled splice with preformed dowel holes in the bottom section and embedded dowels in the upper section.

When dowel splices need to be driven, assist the Engineer in performing dynamic instrumentation during the driving of each dowel spliced pile to monitor and control the stresses and verify the splicing integrity. Replace any damaged pile splices in accordance with 455-11.2.7. Provide the Engineer 48 hours advance notification prior to driving spliced piles.

Mechanical pile splices shall be capable of developing the following capacities in the pile section unless shown otherwise in the Plans and capable of being installed without damage to the pile or splice:

1. Compressive strength = (Pile Cross sectional area) x (28 day concrete strength)
2. Tensile Strength = (Pile Cross sectional area) x 900 psi

Pile Size (inches)	Bending Strength (kip-feet)
18	245
20	325
24	600
30	950

455-7.9 Pile Cut-offs: After the completion of driving, cut piles off which extend above the cut-off elevation with an abrasive saw. Make the cut the depth necessary to cleanly cut through the prestressed strands. Take ownership and dispose of cut-off sections not used elsewhere as allowed by this Section.

455-8 Steel Piling.

455-8.1 Description: Furnish, splice, drive, and cut off structural steel shapes to form bearing piles. Include in this work the installation of bracing members of structural steel by bolting or welding, construction of splices and the filling of pipe piles with the specified materials.

455-8.2 Material: For the material in steel piles, pile bracing, scabs, wedges, and splices, meet the requirements of Section 962.

455-8.3 Pile Splices: Order and use the full authorized pile length where practicable. Do not splice to obtain authorized lengths less than 40 feet except when shown in the Plans. Locate all splices in the authorized pile length in portions of the pile expected to be at least 15 feet below the final ground surface after driving. When it is not practicable to provide authorized pile lengths longer than 40 feet in a single length, use no more than one field splice per additional 40 feet of authorized pile length. Shop splices may be used to join single lengths of pile which are at least 20 feet in length. One shorter segment of pile may be used to achieve the authorized pile length when needed.

Where the pile length authorized is not sufficient to obtain the required bearing value or penetration, order an additional length of pile and splice it to the original length.

Make all splices in accordance with details shown in the Plans and in compliance with the general requirements of AWS D1.1 or American Petroleum Institute Specification 5L (API 5L).

455-8.4 Welding: Make all welded connections to steel piles by electric arc welding, in accordance with details shown in the Plans and in compliance with the general requirements of AWS D1.5. Electroslag welding is not permitted. Welds will be inspected by visual methods.

455-8.5 Pile Heads and Tips: Cut off all piles at the elevation shown in the Plans. If using a cutting torch, make the surface as smooth as practical.

Where foundation material is so dense that the Contractor cannot drive the pile to the required penetration and firmly seat it without danger of crumpling the tip, reinforce the tips with approved cast steel point protectors, as shown in the Plans or required by the Engineer. Construct point protectors in one piece of cast steel meeting the requirements of ASTM A27, Grade 65-35 heat treated to provide full bearing for the piles. Attach points by welding according to the recommendations of the manufacturer.

455-8.6 Pile Bent Bracing Members: Place structural steel sway and cross bracing, and all other steel tie bracing, on steel pile bents and bolt or weld in place as indicated in the Plans. Where piles are not driven into position in exact alignment as shown in the Plans, the Engineer may require the use of fills and shims between the bracing and the flanges of the pile. Furnish and place all fills and shims required to square and line up faces of flanges for cross bracing at no additional expense to the City.

455-8.7 Coating: Coat exposed parts of steel piling, wedging, bracing, and splices in accordance with the provisions for coating structural steel as specified in Section 560.

455-8.8 Storage and Handling: While handling or transporting the piles from the point of origin and into the leads, store and handle in the manner necessary to avoid damage due to bending stresses. In general, lift steel piles by means of a suitable bridge or a sling attached to the pile at appropriate points to prevent damage. Lift the pile from the horizontal position in a
manner that will prevent damage due to bending of the flanges and/or web.

455-8.9 Filling Pipe Piles: When required by the Plans, fill pipe piles with the specified materials. Use clean concrete sands and concrete meeting the requirements of Section 346. Place concrete in pipes containing water using methods in accordance with 455-15.9 with modified tremie and pump line sizes. Concrete may be placed directly into pipes which are dry. Construct and place reinforcement cages in accordance with 455-16. Reinforcement cages may be installed before concrete placement or after concrete placement is completed if proper alignment and position is obtainable.

455-9 Sheet Piling.

455-9.1 Description: Leave permanent piling in place as part of the finished work and generally remove temporary piling after each construction phase.

455-9.2 Materials: Meet the following requirements:

Concrete .....Section 346
Bar Reinforcement .....Section 931
Prestressing Reinforcement .....Section 933
Steel Sheet Piles* .....Section 962
*For temporary steel sheet piles meet the requirements specified in the Plans.

455-9.3 Steel Sheet Piling: Drive steel sheet piling and cut off true to line and grade. Install steel sheet piling with a suitable hammer. Remove and replace any section damaged during handling and installation at no additional expense to the City.

455-9.3.1 Method of Installation: Where rock or strong material is encountered such that the sheet piles cannot be set to grade by driving, remove the strong material by other acceptable means, such as excavation and backfilling or by punching. When the Plans do not indicate the existence of rock or strong material, work of removing, drilling or punching the strong material or rock will be paid for as Unforeseeable Work.

455-9.4 Concrete Sheet Piling:

455-9.4.1 Description: Ensure that concrete sheet piling is of prestressed concrete construction and manufactured, cured, and installed in accordance with the requirements of the

Contract Documents. Use these piles in bulkheads and abutments and at other locations as shown in the Plans.

455-9.4.2 Manufacture of Piles: Ensure that the piles are fabricated in accordance with Section 450.

455-9.4.3 Method of Installation: Jet concrete sheet piling to grade where practical. The Engineer will require a minimum of two jets. Provide water at the nozzles of sufficient volume and pressure to freely erode material adjacent to the piles. Where encountering rock or strong material, such that the sheet piles cannot be set to grade by jetting, remove the strong materials by other acceptable means, such as excavation and backfilling, drilling or by punching with a suitable punch. When the Plans do not indicate the existence of rock or strong material and the piles cannot be set by jetting, the City will pay for the work of removing, drilling or punching the strong material or rock as Unforeseeable Work.

455-9.4.4 Grouting and Caulking: Concrete sheet piles are generally detailed to have tongues and grooves on their lower ends, and double grooves on their upper ends. Where so detailed, after installation, clean the grooves of all sand, mud, or debris, and fully grout the grooves. Use approved plastic bags (sheaths) which will meet the shape and length of the groove to be grouted to contain the plastic grout within the double grooves. Provide grout composed of one part cement and two parts sand. The Contractor may use clean local sand or sand meeting the requirements of Section 902 in this grout. In lieu of sand-cement grout, the Contractor may use concrete meeting the requirements of Section 347, using small gravel or crushed stone coarse aggregate. Deposit the grout through a grout pipe placed within a watertight plastic sheath (bag) extending the full depth of the double grooves and which, when filled, completely fills the slot formed by the double grooves.

455-9.5 Storage and Handling: Handle and store all sheet piles in a manner to prevent damage. Handle long sheet piles with fabric slings or braided wire rope constructed of six or more wire ropes placed at appropriate lift points to prevent damage due to excessive bending.

455-10 Pile Installation Plan.

455-10.1 General: Complete the Pile Driving Installation Plan form provided by the Engineer. Return the Pile Driving Installation Plan information to the Engineer at the preconstruction conference or no later than 30 days before driving the first pile. Ensure the Pile Driving Installation Plan information includes the following:

1. List and size of proposed equipment including cranes, barges, driving equipment, jetting equipment, compressors, and preformed pile hole equipment. Include manufacturer's data sheets on hammers.
2. Methods to determine hammer energy in the field for determination of pile capacity. Include in the submittal necessary charts and recent calibrations for any pressure measuring equipment.
3. Detailed drawings of any proposed followers.
4. Detailed drawings of templates.
5. Details of proposed load test equipment and procedures, including recent calibrations of jacks and required load cells.
6. Sequence of driving of piles for each different configuration of pile layout. structures.
7. Details of proposed features and procedures for protection of existing
8. Required shop drawings for piles, cofferdams, etc.
9. Methods and equipment proposed to prevent displacement of pilesduring placement and compaction of fill within 15 feet of the piles.
10. Methods to prevent deflection of battered piles due to their own weight and to maintain their as-driven position until casting of the pile cap is complete.
11. Proposed pile splice locations and details of any proprietary splices anticipated to be used.

12. Methods and equipment proposed to prevent damage to voided or cylinder piles due to interior water pressure.

Notify the Engineer of any test pile driving and production pile driving at least one week prior to beginning the installation operations of any pile.

455-10.2 Acceptance of Equipment and Procedures: All equipment and procedures are subject to satisfactory field performance. Make any required changes that may result from unsatisfactory field performance. The Engineer will give final acceptance after the Contractor makes necessary modifications. Do not make any changes in the driving system after acceptance without authorization of the Engineer. A hammer repaired on site or removed from the site and returned is considered to have its performance altered (efficiency increased or decreased), which is considered a change in the driving system and is subject to a dynamic load test in accordance with 455-5.13 at no additional compensation.

455-11 Method of Measurement (All Piling).

455-11.1 Treated Timber Piling: The quantity to be paid for will be the length, in feet, furnished, placed, and accepted according to the authorized lengths list, including any additions and excluding any deletions thereto, as approved by the Engineer.

455-11.2 Prestressed Concrete Piling:

455-11.2.1 General: The quantity to be paid for will be the length, in feet, of prestressed concrete piling furnished, driven and accepted according to the authorized lengths list, including any additions and excluding any deletions thereto, as approved by the Engineer.

455-11.2.2 Furnished Length: The furnished length of precast concrete piles will be considered as the overall length from head to tip. Final pay length will be based on the casting length as authorized in accordance with 455-5.14.3 subject to provisions of 455-11.2.3 through 455-11.2.8, 455-11.8, 455-11.9 and 455-11.12.

455-11.2.3 Build-ups: The lengths of pile build-ups authorized by the Engineer, measured from the plane of cutback or the joint between the sections, to head of build-up, will be included in the quantities of piling.

455-11.2.4 Piles Requiring Cut-offs: No adjustments in the length, in feet, of piling will be made if cut-offs are required after the pile has been driven to satisfactory bearing.

455-11.2.5 Piles Driven Below Cut-off Elevation: Where a pile is driven below cut-off elevation and satisfactory bearing is obtained so that no further driving is required, the length of pile will be measured from cut-off elevation to tip of the pile.

455-11.2.6 Driving of Splice: If a pile is driven below cut-off and satisfactory bearing is not obtained, and additional driving is required after construction of a satisfactory splice, an additional 10 feet of piling will be paid for the additional driving. This compensation for driving of splice, however, will not be allowed for test piles that are spliced and redriven.

455-11.2.7 Replacing Piles: In the event a pile is broken or otherwise damaged by the Contractor to the extent that the damage is irreparable, in the opinion of the Engineer, the Contractor shall extract and replace the pile at no additional expense to the City. In the event that a pile is mislocated by the Contractor, the Contractor shall extract and replace the pile at no expense to the City except when a design change proposed by the Contractor is approved by the City as provided in 455-5.15.5.

In the event that a pile is driven below cut-off without obtaining the required bearing, and the Engineer elects to have the pile pulled and a longer pile substituted, it will be paid for as Unforeseeable Work. In the event a pile is damaged or mislocated, and the damage or mislocation is determined to be the City's responsibility, the Engineer may elect to have the pile extracted, and it will be paid for as Unforeseeable Work. If the extracted

pile is undamaged and driven elsewhere the pile will be paid for at 30% of the Contract unit price for Piling. When the City determines that it is responsible for damaged or mislocated pile, and a replacement pile is required, compensation will be made under the item for piling, for both the original pile and replacement pile.

The Contractor may substitute a longer pile in lieu of splicing and building-up a pile. In this event, the Contractor will be paid for the original authorized length of the pile, plus any additional length furnished by the Contractor up to the authorized length of the build-up, as piling. The Contractor will be paid 30 feet of piling as full compensation for extracting the original pile.

455-11.2.8 Underwater Driving: When the Contractor selects one of the optional underwater driving methods, payment will be made by selecting the applicable method from the following:

1. Using a pile longer than the authorized length: Payment for piling will be made only for the authorized length at that location unless the length of pile from cut-off elevation to the final tip elevation is greater than the authorized length, in which case payment for piling will be made from cut-off elevation to final tip elevation. No payment will be made for pile splice, when this option is selected, unless the pile is physically spliced and the splice is driven below cut-off elevation to achieve bearing. When making and driving a pile splice below cut-off elevation to achieve bearing, the length to be paid for piling will be the length between cut-off elevation and final pile tip elevation.

2. Using an underwater hammer: Payment for piling and pile splices will be in accordance with 455-11.2.1 through 455-11.2.7 and 455-11.9.2. The Contractor shall furnish additional lengths required to provide the full length confirmation pile at no expense to the City. Payment for piling for the full length confirmation pile will be the authorized length of the pile, unless the length driven below cut-off elevation is greater than the authorized length, in which case the length to be paid for will be the length between cut-off elevation and the final tip elevation. Splices in confirmation piles will be paid for only when the splice is driven below cut-off elevation.

3. Using a pile follower: When a pile follower is used with a conventional pile driving system, the method of payment will be the same as shown above in 455-11.9.2.

455-11.3 Steel Piling:

455-11.3.1 General: The quantity to be paid for will be the length, in feet, of steel piling furnished, spliced, driven and accepted, up to the authorized length, including any additions and excluding any deletions thereto as approved by the Engineer.

455-11.3.2 Point Protectors: The quantity to be paid for will be each for the total of point protectors authorized, furnished, and properly installed.

455-11.4 Test Piles: The quantity to be paid for of test piles of various types, will be the length, in feet, of test piling furnished, driven and accepted, according to the authorized length list, and any extensions thereof as approved by the Engineer.

Where a test pile is left in place as a permanent pile, it will be paid for only as test piles. Any extensions necessary to continue driving the pile for test purposes, as authorized by the Engineer, will be paid for as test piles. Other extensions of piles, additional length paid for splicing and build-ups will be included in the quantities of regular piling and will not be paid for as test piling.

455-11.5 Dynamic Load Tests: Payment will be based on the number of dynamic load tests shown in the Plans, authorized by the Engineer, or required in 455-5.11.7, completed and accepted in accordance with the Contract Documents. No separate payment will be made for dynamic load tests used to evaluate the Contractor's driving equipment. This will generally be done on the first test pile or production pile driven on a project with each combination of proposed hammer and pile size and/or a separate pile to evaluate any proposed followers, or piles driven to evaluate proposed changes in the driving system. No payment will be made for

dynamic load tests used to evaluate the integrity of a pre-planned epoxy-bonded dowel splice. Include all costs associated with dynamically testing production piles with epoxy-bonded dowel splices under Pay Item No. 455-34. No payment will be made for dynamic load tests on test piles.

For structures with 100% dynamic testing, the cost of supplying and installing internal gauges or attaching external gauges to each pile for dynamic load tests is included in the cost of the pile and no separate payment will be made.

For structures without 100% dynamic testing, the cost of supplying and installing internal gauges or attaching external gauges to each production pile for dynamic load testing prior to initial driving, authorized by the Engineer, will be 20 feet of additional pile. No payment will be made for attaching dynamic testing equipment for set-checks or redrives.

455-11.6 Steel Sheet Piling: The quantity to be paid for will be the plan quantity area, in square feet, measured from top of pile elevation to the bottom of pile elevation and beginning and end wall limits as shown in the Plans with no allowance for variable depth surface profiles.

Approved alternate support structures would be paid for as plan quantity computed for sheet pile. Sheet piling used in cofferdams and to incorporate the Contractor's specific means and methods, and not ordered by the Engineer, will be paid for as required in Section 125.

455-11.7 Concrete Sheet Piling: The quantity to be paid for will be the product of the number of such piles satisfactorily completed, in place, times their lengths in feet as shown in the Plans or authorized by the Engineer. This quantity will be based upon piles 2-1/2 feet wide.

When the Engineer approves, the Contractor may furnish the concrete sheet piling in widths wider than shown in the Plans; then the number of piles shall be the actual number of units completed times the width used divided by the width in the Plans.

455-11.8 Pile Splices: The quantity to be paid for authorized drivable splices and build- ups greater than 5 feet in length in concrete piling, and test piling, which are made for the purpose of obtaining authorized pile lengths longer than shown as the maximum length in the Standard Indexes, for obtaining greater lengths than originally authorized by the Engineer, to incorporate test piling in the finished structure, for further driving of test piling, or for splices shown in the Plans, will be 30 feet of additional prestressed concrete piling under Pay Item
No. 455-34.

For concrete piles and test piles, where the build-up is 5 feet or less in length, the quantity to be paid for will be 9 feet of prestressed concrete piling under Pay Item No. 455-34 as compensation for drilling and grouting the dowels and all other costs for which provision has not otherwise been made.

The quantity to be paid for authorized splices in steel piling and test piling for the purpose of obtaining lengths longer than the lengths originally authorized by the Engineer will be
20 feet of additional steel piling under Pay Item No. 455-35.

455-11.9 Set-Checks and Redrives:

455-11.9.1 Set Checks/Test Piles: There will be no separate payment for the initial four set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

455-11.9.2 Set Checks/Production Piles: There will be no separate payment for the initial two set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

455-11.9.3 Redrives: The quantity to be paid for will be the number of redrives, each, authorized by the Engineer. Payment for any pile redrive (test pile or production pile) ordered by the Engineer will consist of 20 feet of additional piling.

455-11.10 Pile Extraction: Piles authorized to be extracted by the Engineer and successfully extracted as provided in 455-11.2.7 will be paid for as described in 455-11.2.7. No payment for

extraction will be made for piles shown in the Plans to be extracted or piling damaged or mislocated by the Contractor that are ordered to be extracted by the Engineer.

455-11.11 Static Load Tests: The quantity to be paid for will be the number of static load tests of the designated tonnages, each, as shown in the Plans or authorized by the Engineer, actually applied to piles, completed and accepted in accordance with the Plans and these Specifications.

455-11.12 Preformed Pile Holes: The quantity added to the payment for piling will be 30% of the length of completed preformed pile holes from existing ground or the bottom of any required excavation, whichever is lower, to the bottom of preformed hole acceptably provided, complete for the installation of the bearing piles, regardless of the type of pile (test pile or production pile) installed therein. Only those holes authorized to be paid for, as provided in 455-5.9.3, will be included in the measurement for payment. The Engineer will authorize payment for preformed pile holes only when the pile has been placed in proper position and has achieved the required penetration.

455-12 Basis of Payment (All Piling).

455-12.1 Treated Timber Piling: Price and payment will be full compensation for furnishing all materials, including collars, metal shoes, copper cover sheets, preservatives and tar, and for wrapping pile clusters with wire cable, where so shown in the Plans.

455-12.2 Prestressed Concrete Piling: Price and payment will be full compensation for the cost of furnishing and placing all reinforcing steel, predrilled holes, furnishing the material for and wrapping pile clusters with wire cable where so shown in the Plans and grouting of preformed pile holes when shown in the Plans.

455-12.3 Steel Piling: Price and payment will be full compensation for all labor, equipment, and materials required for furnishing and installing steel piling, including welding and painting as specified and the cost of predrilling pile holes described in 455-5.1.1. The cost of any sand or concrete fill and reinforcing steel in pipe piles will be included in the price for steel piling.

Bracing and other metal parts attached to or forming a part of piling or bracing and not otherwise classified, will be measured and paid for as provided in Section 460.

455-12.4 Test Piles: Price and payment will be full compensation for all incidentals necessary to complete all the work of this item except splices, build-ups, pile extractions and preformed pile holes authorized by the Engineer and paid for under other pay items or payment methods. The cost of all additional work not listed above necessary to ensure required penetration and attain required bearing of the test piles will be included in the price bid per foot of test pile, including driving and all other related costs.

455-12.5 Dynamic Load Tests:

455-12.5.1 Dynamic Load Tests/ Test Piles: All test piles will require dynamic load tests. Include all costs associated with assisting the Engineer in performing the dynamic load tests in the pay items for test piles.

455-12.5.2 Dynamic Load Tests/ Production Piles: Payment will be full compensation for all costs associated with assisting the Engineer in performing the dynamic load tests.

455-12.6 Steel Sheet Piling:

455-12.6.1 Permanent Sheet Piling: Price and payment will be full compensation for all labor, equipment, and materials required for furnishing and installing steel sheet piling including preformed holes and coating, but will not include furnishing and placing anchors when an anchored wall system is designed and detailed in the Plans. In such cases, furnishing and installing anchors will be paid for separately.

455-12.6.2 Temporary Sheet Piling: For critical temporary steel sheet pile walls, walls which are necessary to maintain the safety of the traveling public or structural integrity of nearby structures, roadways and utilities during construction, that are detailed in the Plans, price and payment will be full compensation for all labor, equipment, and materials required for

furnishing and installing steel sheet piling including preformed holes when shown in the Plans, and including wales, anchor bars, dead men, soil anchors, proof tests, creep tests, and other incidental items when an anchored wall system is required. Removal of the sheet piling, anchors, and incidentals will be included in the cost per square foot for steel sheet piling (critical temporary). When the temporary steel sheet pile walls are not detailed in the Plans, the cost of furnishing and installation shall be incidental to cost of other related items and no separate payment shall be made. If the wall is not shown in the Plans, but deemed to be critical as determined by the Engineer, then a design shall be furnished by the City and paid for separately under steel sheet piling (critical temporary).

455-12.7 Concrete Sheet Piling: Price and payment will be full compensation for furnishing all materials, including reinforcing steel, grouting, plastic filter fabric, preformed holes and installation.

455-12.8 Preformed Pile Holes: There is no separate pay item for preformed pile holes. Payment will be made as the unit price for piling of the applicable pile type. Payment will be full compensation for all labor, equipment, casings and materials required to perform this work.

455-12.9 Point Protectors: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

455-12.10 Static Load Tests: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

455-12.11 Pile Cut-Off: Anticipate all piles will require cutting-off, and include all costs associated with pile cut-off in the pay items for piling.

455-12.12 Payment Items: Payment will be made under:

Item No. 455- 2-	Treated Timber Piling - per foot.
Item No. 455- 14-	Concrete Sheet Piling - per foot.
Item No. 455- 34-	Prestressed Concrete Piling - per foot.
Item No. 455- 35-	Steel Piling - per foot.
Item No. 455- 36-	Concrete Cylinder Piling - per foot.
Item No. 455-119-	Test Loads - each.
Item No. 455-120-	Point Protection - each.
Item No. 455-133-	Sheet Piling - per square foot.
Item No. 455-143-	Test Piles (Prestressed Concrete) - per foot.
Item No. 455-144-	Test Piles (Steel) - per foot.
Item No. 455-145-	Test Piles (Concrete Cylinder) - per foot.

SECTION 458 - BRIDGE DECK JOINTS

458-1 Description.

Furnish and install bridge deck joints of the types and at the locations shown in the Plans. This Section covers the following types of joints:

Poured Joint
Poured Joint with Backer Rod System
Strip Seal Joint System
Modular Joint

458-2 Materials.

458-2.1 General: Transport, store and prepare all joint materials and components for all joint types as per the manufacturer's recommendations.

458-2.2 Poured Joint: Furnish a Type D silicone sealant material meeting the requirements of Section 932 that is listed on the Approved Product List (APL).

458-2.3 Poured Joint with Backer Rod System: Furnish poured joint with backer rod systems consisting of Type D silicone sealant material, foam backer rods, sidewalk cover plates (as required) and all associated miscellaneous components.

The Type D silicone sealant material used in the system shall be listed on the APL and meet the requirements of Section 932.

458-2.4 Strip Seal Joint System: Furnish strip seal joint systems in accordance with ASTM D5973 and Design Standards, Index No. 21100 that are listed on the APL. Manufacturers seeking evaluation of their product for the APL shall submit an application in accordance with Section 6. Design documentation showing the expansion joint system shall include installation details and temporary or sacrificial support brackets, bolts, clamps, etc. that are compatible with decks constructed with or without block-outs. Furnish joint systems consisting of watertight steel edge rails, elastomeric strip seals, sidewalk cover plates (as required) and all associated miscellaneous components. Obtain the elastomeric strip seals from the edge rail manufacturer.

458-2.5 Sidewalk Cover Plates: Furnish slip resistant, random hatch matrix or suitable pattern, galvanized steel sidewalk cover plates fabricated from steel meeting the requirements of ASTM A36 or ASTM A709, Grade 36 or 50. Do not use diamond plate or surface applied slip resistant tapes, films, nonmetallic coatings or other similar materials. Fabricate cover plates in accordance with Design Standards, Index Nos. 21100 and 21110. After shop fabrication, hot-dip galvanize cover plates in accordance with Section 962. Galvanized sidewalk cover plates shall have a minimum coefficient of friction on the top surface of 0.8 in dry condition, and 0.65 in a wet condition, as determined by ASTM F1677-05 or ASTM F1679-04. Furnish flat head stainless steel sleeve anchors in accordance with ASTM F593 Group 1 Alloy 304 for attaching sidewalk cover plates. Install sleeve anchors in accordance with the manufacturer's instructions.

458-2.6 Modular Joint: Furnish modular joints meeting the requirements of this Section. Submit manufacturer certification that modular joint components meet the following material requirements.

Table 2-6.1 Component Material Requirements	
Solid Separation Beams, Steel Extrusions, Support Bars, and Milled Steel Shapes	ASTM A588 or ASTM A572

Table 2-6.1 Component Material Requirements	
Box Seals	ASTM D2628*
Adhesive	ASTM D4070
Stud Shear Connectors and Threaded Studs	ASTM A108
Connection Plates – 3/8 inch minimum thickness	ASTM A588 or ASTM A572
Sliding Plates - 3/8 inch minimum thickness	ASTM A240, Type 316
Sliding Plates - 3/8 inch minimum thickness	ASTM D4895-10
Railing and Sidewalk Cover Plates – 1/2 inch minimum thickness	ASTM A36**
*Provide seals with hardness Type A durometer equal to 55 (plus or minus 5) by ASTM D2240. **Hot-dip galvanize railing and sidewalk cover plates in accordance with Section 962.	

Supply test results from the manufacturer verifying the maximum coefficient of friction between mating surfaces. Testing must be performed by an independent testing laboratory according to the manufacturer's stated precompression values for the system to a minimum of two million cycles. Maximum allowed coefficient of friction is 0.10.

Provide PTFE bonded steel sliding plates using a heat cured, high temperature epoxy capable of withstanding temperatures of minus 40°F to plus 250°F.

Use preformed elastomeric joint seals of multiple-web design that comply with ASTM D3542. Use preformed elastomeric joint seals of the strip type that comply with ASTM D5973.

For springs, bearing, and equidistance devices (i.e. control springs), use the same material composition and formulation, manufacturer, fabrication procedure and configuration as those used in the prequalification test.

458-3 Calculations and Shop Drawings.

458-3.1 All Joint Types (with the exception of Poured Joints): Submit shop drawings in accordance with Section 5 for any applicable joint system supplied. For format and required details, follow the AASHTO/NSBA Steel Bridge Collaboration "Guideline for Shop Detail Drawing Presentation". The following information must be included on the shop drawings:

1. The name and address of the joint system manufacturer, including the physical address where the fabrication is performed.
2. The joint manufacturer's instructions for proper installation, including the proper width settings for a minimum 100°F temperature range. Shop drawings that are submitted without this information will be returned without review.
3. Show all materials including project specific details and dimensions. Include the joint model number and joint movement range.

458-3.2 Sidewalk Cover Plates: Submit shop drawings for sidewalk cover plates showing all materials, project specific details and dimensions. The submittal must include a certification from the manufacturer that the sidewalk cover plates meet the minimum coefficient of friction requirements.

458-3.3 Strip Seals: Provide the APL number in the shop drawings.

458-3.4 Modular Joints: When support boxes are supported by the deck or abutment, detail in the shop drawings a minimum of 2 inches between the bottom surfaces of the joint elements and the deck blockouts to allow easy placement of concrete and allow for proper consolidation of concrete under and around all parts of the joints.

Detail in the shop drawings at least 6 inches of clear space between the support boxes or anchorages on the ends of support boxes and the periphery of the blockout to permit placing of concrete.

Submittal of shop drawings must include a manufacturer's installation manual in accordance with this Section.

Include design calculations, signed and sealed by a Professional Engineer licensed in the State of Florida, confirming that all load bearing components are in conformance with the requirements of this Section.

458-4 Fabrication and Installation.

458-4.1 General: Install the joint in accordance with the specific requirements of this Section, the plan details, the Design Standards, and the manufacturer's installation instructions for the particular type of expansion joint to be installed.

458-4.2 Poured Joint: Install the joint at the locations and in accordance with the details shown in the Plans and the manufacturer's recommendations.

458-4.3 Poured Joint with Backer Rod System:

458-4.3.1 Casting Joint Opening: When casting the bridge deck, approach slab or raised sidewalk adjacent to the expansion joint at temperatures other than 70°F, adjust the joint opening (Dim. A as shown in the Design Standards, Index No. 21110) at 70°F by the amount of the adjustment per 10°F shown in the Structures Plans, Poured Expansion Joint Data Table. For temperatures above 70°F, decrease the opening. For temperatures below 70°F, increase the opening.

458-4.3.2 Installation of Poured Joint System: After deck profiling, grinding, and grooving operations are complete, install poured joint with backer rod in accordance with the manufacturer's recommendations, when the joint opening is plus or minus 1/4 inch of the design joint opening (Dim A at 70°F) shown in the Structures Plans, Poured Expansion Joint Data Table. The minimum opening must not be less than 1 inch at the time of installation. Place poured joint material only when the ambient temperature is between 55°F and 85°F and is
expected to rise for the next three hours minimum to provide for adequate joint opening and compression of the poured joint material during curing.

458-4.4 Strip Seal System:

458-4.4.1 Elastomeric Seal Fabrication: Furnish continuous heavy duty bridge deck elastomeric seals sized in accordance with the manufacturer's recommendations, to perform satisfactorily for the opening range shown. Minimum movement classification is 4 inches. Shop vulcanization is restricted to use on horizontal turns on skewed bridges at upturn ends where the horizontal turn angle is greater than 35 degrees. Field vulcanization is not permitted.

458-4.4.2 Edge Rail Fabrication:

1. Furnish extruded, hot rolled or machined solid steel edge rails in accordance with ASTM A709, Grade 36, 50 or 50(W). Furnish edge rails with a minimum mass of 19.2 lb/ft excluding studs, a minimum height of 8 inches, a minimum thickness of 1/2 inch and a maximum top surface (riding surface) width of 2 inches. Edge rails manufactured from bent plate or built up pieces are not acceptable.

2. Furnish anchor studs in accordance with ASTM A108, and electric arc end-weld anchor studs with complete fusion. Anchor studs may be piggy backed to achieve required lengths.

3. Perform all shop welding in accordance with the Bridge Welding Code

ANSI/AASHTO/AWS D1.5. Do not weld to surfaces in contact with the elastomeric seal or the top surface (riding surface) except as shown in the shop splice detail. Do not weld inside seal cavity.

4. Fabricate edge rail assemblies in one piece including upturns. Splices in an individual joint are only permitted where a construction joint is specifically required by the Plans, joint segment length exceeds 50 feet, or approved by the Engineer in writing. Shop splice sections of edge rail to obtain the required length by partial penetration double V-groove welds on prepared beveled edges and seal welds as shown in the shop splice detail. Weld all around the joint as far as practical to achieve a watertight seal. Do not use short pieces of edge rail less than
6 feet 0 inches long unless required at curbs, sidewalks or phase construction locations.

5. After shop fabrication, hot-dip galvanize edge rail in accordance with Section 962 and the manufacturer's recommendations.

6. Furnish temporary or sacrificial support brackets, bolts, clamps, etc. that are capable of resisting shipping, handling and construction forces without damage to the edge rail assemblies or galvanized coating and are adjustable to account for variable temperature settings. Do not use temporary or sacrificial support brackets, bolts, clamps, etc. between the faces of the edge rails.

7. Clearly match mark corresponding edge rail assemblies with joint location and direction of stationing.

458-4.4.3 Installation:

1. Install the edge rail assemblies at proper grade and alignment before or after deck planing in accordance with the manufacturer's instructions. When installed after deck planing and grinding, install the edge rail assemblies in the block-outs on a profile tangent between the ends of the deck and/or approach slab to within a plus 0 inch and minus 1/4 inch variation. When installed before deck planing, install the edge rail assemblies 3/8 inches, plus or minus 1/16 inch, below the top surface of the deck or approach slab to compensate for concrete removal during planing and grinding.

2. Bolt, weld or clamp edge rail assemblies in position using temporary or sacrificial brackets as required. For phased construction, install edge rail assemblies in a given subsequent phase to align with those installed in an adjacent prior phase after deflection and rotation due to deck casting of adjoining spans has occurred.

3. For installation of edge rail assemblies at temperatures other than 70°F, adjust the opening of the joint (Dim. A as shown in the Design Standards, Index No. 21100) by the amount of the adjustment per 10°F shown in the Structures Plans, Strip Seal Expansion Joint Data Table. For temperatures above 70°F, decrease the opening. For temperatures below 70°F, increase the opening.

4. After galvanizing, do not weld within 2 inches of edge rail surfaces exposed in the completed structure. Do not weld expansion joint components to or electrically ground to reinforcing steel or structural steel. Seal field butt joints and empty shipping and erection holes with caulk before placing deck concrete.

5. Protect galvanized edge rail assemblies during screeding operations per the manufacturer's recommendations. Provide temporary blocking material in the edge rail seal cavities to prevent concrete intrusion during deck pour and finishing.

6. Loosen any temporary or sacrificial support brackets, bolts, clamps, etc. that span across the joint after initial set of concrete, but not more than two hours after conclusion of concrete placement.

7. Install elastomeric seal after completion of deck casting. Remove all joint form material and blocking material prior to installing elastomeric seal. Field install elastomeric seal in accordance with manufacturer's recommendations. Thoroughly coat all contact surfaces between the elastomeric seal and the edge rail seal cavities with an adhesive lubricant before setting elastomeric seal in place.

458-4.5 Modular Joints

458-4.5.1 Fabrication: Perform all steel fabrication in accordance with the requirements of Section 460.

After fabrication, hot-dip galvanize all non-stainless steel metal surfaces in accordance with Section 962.

Joint systems must be designed in accordance with the latest edition of AASHTO LRFD Bridge Design Specifications or as required by the Contract Documents. Supply joint systems for which identical full-size specimens have been subjected to full life-cycle fatigue testing. Obtain all joint system components from the same manufacturer, fabricated at their approved corporate facilities, using subcomponents meeting the testing requirements of this Section.

Provide all load bearing structural steel components with a 1/4 inch minimum thickness in any direction. Construct edge rails consisting of a monolithic steel shape with a machined or extruded retainer cavity. Multiple component welded steel shapes to achieve a final member cross section or seal retainer cavity are not permitted. Attach separation beams to individual support bars with a complete joint penetration weld.

Support each separation beam with a dedicated support bar connected by a complete joint penetration welded connection. Use of bolted connections, yokes, or other means to directly attach separation beams to support bars is not permitted. Maintain equal spacing between separation beams at all stages of movement.

Contain support bars with bearings capable of transferring all imposed loads to the structure and allow the support bar to freely move within the limits of the expansion
joint.

Fabricate a full length modular joint system as one piece. Only a minimal number of splices in an individual joint may be permitted where a construction joint is specifically required by the Plans, joint segment length exceeds 50 feet, or approved by the Engineer in writing.

When phased construction is permitted or required by the Contract Documents, fabricate each segment to exactly fit that portion of superstructure, including sidewalks, under construction in each specific phase. Connect segments with a bolted splice to ensure continuity. Fit segments with temporary seals. Lubricant adhesive is not required for temporary seals. Submit watertight seal details for the splice. Shop inspection will be conducted at the discretion of the Engineer in accordance with Article 5-6.

Fabricate final seal assembly as one single, continuous component. Splicing of seals in the field is not permitted.

Provide lifting devices and devices to maintain the preset opening of the joint at a uniform spacing of not greater than 15 feet along the length of the joint. Provide at least three of these preset opening devices per joint segment.

Direct the manufacturer to preset the joint opening in accordance with joint opening as shown in the Plans at 70°F, prior to shipment.

Prior to installation, place the centerbeam/support bar assembly on a flat surface to verify the support bars lay in a single plane, with no part of the bottom of any support bar exceeding 0.25 inches off the surface. The subassembly may be straightened. No more than three attempts may be made to heat-straighten the subassembly.

Polish stainless steel sliding surfaces to an 8 µ-inch mirror finish.

458-4.5.2 Installation: Clean any metal surface component exhibiting surface rust and field metalize in accordance with Section 562. Replace any component exhibiting pitting and/or section loss with a new component.

Install the joint system in strict compliance with the manufacturer's instructions in the shop drawings and as directed by the manufacturer's installation technician.

458-4.5.2.1 Manufacturer's Installation Manual: Submit the manufacturer's installation manual at least two weeks prior to installation activities, containing complete and detailed installation instructions for the modular expansion joint supplied by the Contractor. The manual must include step-by-step installation instructions and all related manufacturer's recommendations, including bridge deck pouring sequence, restraints, finishing, etc., for successful installation and long term operation and serviceability of the joint.

458-4.5.2.2 Manufacturer's Installation Technician: Provide for a manufacturer's installation technician, under the direct employ of the manufacturer, to be on the jobsite prior to the first joint installation and in sufficient time to train the Contractor's joint installation crews using the shop drawings and the manufacturer's installation manual. The manufacturer's installation technician must remain on the jobsite and be present for all modular joint installation activities for a minimum of the first two joints for each of the Contractor's installation crews. The manufacturer's installation technician will submit written certification to the Engineer that the Contractor's installation process follows the requirements outlined in the manufacturer's installation manual.

458-4.5.2.3 Field Inspection: The Engineer will inspect the joint system for proper alignment, complete bond between neoprene gland seal and steel, and proper stud placement and effectiveness.

Bends or kinks in the joint system steel are not allowed except as necessary to follow roadway grades. Straightening of any bends or kinks in the steel, whether intentional or inadvertent, is not allowed. Any joint system exhibiting bends or kinks will be rejected, removed from the jobsite, and replaced by a new joint system. Match joint system to the finished roadway profile and grades before final acceptance.

Restore bond of any neoprene gland seal found not fully bonded to steel.

Visually inspect all stud welds. Test a minimum of 10% of the total number of stud welds at the discretion and direction of the Engineer. Any stud found to not have a complete end weld (as evidenced by a ringing sound when struck by a hammer) will require replacement. Any stud located more than one inch in any direction from location shown in the shop drawings will require removal and a new stud placed in the proper location.

458-4.5.2.4 Width: For installation at temperatures other than 70°F, adjust opening of the joint as shown in the Contract Documents by amount of adjustment per 10°F shown in the Contract Documents. For temperatures above 70°F, decrease the opening. For temperatures below 70°F, increase the opening. Release all support brackets as the concrete is being placed and no later than when the concrete takes initial set.

Remove opening devices immediately after the concrete is placed.

458-4.5.2.5 Permanent Seals: When phased construction is necessary, remove temporary neoprene seals and replace with full width permanent seals after joint system is completely installed over full width of structure, including sidewalks.

Clean (SSPC-SP6) all metal surfaces which will be in contact with permanent seals to visual standard CSP6 as defined by SSPC Vis 1-89.

458-4.5.2.6 Final Placement: After modular joint system has been set to its final line and grade, fill any deck joint blockouts with Class II (Bridge Deck) concrete or as specified in the Plans. Prepare contact surfaces in accordance with the same procedure described in this Section. Finish the uppermost surface of concrete placement in accordance with requirements of 400-15, except that machine finishing is not required. Unless otherwise noted in the Plans, include the cost of the pourback in the unit bid price of superstructure concrete.

Construction loads are not allowed on the modular joint for 72 hours after complete installation unless approved by the Engineer. In the event it is necessary to cross the modular joint before the 72 hour prohibition, bridge over the joint in a manner approved by the Engineer.

458-4.5.3 Acceptance: Acceptance of fabricated joint systems will be based on the Engineer's visual inspection at the jobsite and in accordance with requirements of this Section.

Submit certified mill test reports to the Engineer for all steel used to fabricate the joint system.

458-4.5.3.1 Watertight Integrity Test: Test full length of joint system for watertight integrity in accordance with this Section, no more than five working days after each joint system installation is completed. In case of phased construction, perform this test after the full length of joint is installed (after all applicable phases). For the first two joints, perform the watertight integrity test and inspection in the presence of the manufacturer's installation technician and the Engineer. For all remaining joints, perform the watertight integrity test and inspection in the presence of the Engineer.

Cover full length of joint with either water ponded to a minimum 1/2 inch depth, or continuously flowing water directly over full plan area of joint for a 15 minute minimum duration. Inspect underdeck surfaces beneath the joint for any evidence of dripping water or moisture for the 15 minute duration of water application and for 45 minutes after water supply is removed. Watertight integrity of joint system is interpreted as absolutely no free dripping water or moisture on underdeck surfaces beneath joint. Document date, time, and location of joint inspections and submit the report to the Engineer.

Repair joint integrity at every location exhibiting free dripping water or moisture identified during the watertight integrity test and subsequently retest, subject to same conditions and consequences as the initial test. Retest and repair until joints pass the watertight integrity test.

458-5 Method of Measurement.

The poured joint without backer rod will be incidental to the concrete work and included in the cost of the concrete. Poured joints with backer rod, strip seal joints, and modular expansion joints will be the plan quantity length of each type of joint constructed and accepted.

458-6 Basis of Payment.

458-6.1 Basic Items of Joints. The Contract unit price per foot for joints will be full compensation for all work and materials necessary for the complete installation. Such price and payment will include, but not be limited to, the following specific incidental work:

1. Any work required to clean and prepare the adjacent bridge deck, deck block out or deck joint gap.
2. Any work to replace any rejected joints.
3. Any repairs to the galvanizing on metallic joint components.

4. Any additional work or materials required for non-standardized or special construction or installation techniques.

5. Any cost of erection and removal of any temporary supports which may be necessary for ensuring proper alignment and positioning of the joint relative to the bridge deck.

6. Any sidewalk cover plates required.

7. All costs associated with the manufacturer's installation technician.

8. All work related to performance of the watertight integrity test and any necessary repairs and retesting.

458-6.2 Payment Items: Payment shall be made under:

Item No. 458 - 1- Bridge Deck Expansion Joint - per foot.

SECTION 460 - STRUCTURAL STEEL AND MISCELLANEOUS METALS

460-1 Description.

460-1.1 General: Prepare, fabricate, assemble, erect, and perform all nondestructive testing for structural steel or miscellaneous metal structures, or portions thereof in accordance with the Contract Documents.

Obtain Structural Steel and Miscellaneous Metals from a fabricator that is currently on the City's Production Facility Listing. Fabricators seeking inclusion on the list shall meet the requirements of Section 105.

As used in this specification, the following terms shall apply:

Main or primary load-carrying member or component: This designation refers to the following;

1. Longitudinal or transverse rolled beams or fabricated girders (I or box, curved or straight)
2. All truss members not designated as cross frames
3. Cross frames, diaphragms and connection plates of horizontally curved beams or girders
4. Rib members of steel arches
5. Bracing members subjected to and specifically designed for traffic live load and/or other loads
6. Cross frames or diaphragms at pier and abutment supports of tub or box girders (trapezoidal members) and their connection plates
7. Attachments and components of the above such as splice, cover, cross frame and diaphragm connection and gusset plates, but not transverse and bearing stiffeners (unless acting as a cross frame or diaphragm)
8. Cables, moment release pins and links, and hangers
9. All steel substructure members except those designated as secondary in the Contract Documents
10. Other members as may be identified in the Contract Documents

Miscellaneous components - This designation refers to, but is not limited to, the following:

1. Ladders
2. Platforms
3. Bearings
4. Railings
5. End Wall Grates
6. Roadway Gratings
7. Metal Drainage Components
8. Steel Expansion Joint and Components

460-1.2 Fabrication Categories: As a prerequisite for being on the City's Production Facility Listing, fabricators must currently be accredited in accordance with one of the programs in Table 460-1, by fabrication category/categories of the products that they are producing.

Fabricators are required to submit their proposed fabrication Quality Control (QC) Plan for review by the City.

Table 460-1 Fabrication Categories	
Structure Type	Accepted Accreditation Program
Advanced Bridge: Tub or trapezoidal box girders, closed boxed girders, large or non-preassembled truss bridges, arches, cable supported bridges, moveable bridges, and bridges with curved radii tighter than defined for intermediate bridge.	AISC Advanced Bridge
Intermediate Bridge: A rolled beam bridge with field or shop slices, either straight or with a radius over 500 feet: a built-up I-shaped plate girder bridge with constant web depth (except for dapped ends), with or without splices, either straight or with a radius over 500 feet: a build-up I-shaped plate girder with variable web depth (e.g. haunched) either straight or with a radius over 1000 feet; a truss bridge with a length of 200 feet or less that is entirely or	AISC Intermediate Bridge
Simple Bridge: Unspliced rolled sections and pedestrian bridges	AISC Simple Bridge
Highway Metal Components, including Aluminum: Fence materials, guardrails, handrails, reinforcing steel (rebar), casing pipes, metal drainage items, stay-in-place forms, light poles, high mast poles, metal buildings, steel strain poles, bridge rail, stairs, walkways, grid decks, scuppers, expansion joints, bearings, ballast plates, complex expansion joints, high load multi-rotational bearings, bracing not designed for primary loads (diaphragms, cross frames, and lateral bracing), moveable bridge machinery and sign or signal structures erected partially or completely over the traveled roadway or mounted on bridges	AISC Highway Metal Components ISO 9001 AWS CWF
NOTES: An AISC fracture critical (FC) endorsement is required for all FC work. Other accreditations programs may be submitted to the FDOT State Materials Office for review and consideration in addition to the programs listed in the table above.	

460-2 Materials.

Provide the materials specified in the Contract Documents in accordance with Sections 6, 105, ASTM A6, and AASHTO/AWS D1.5, Bridge Welding Code. Fabricate all unpainted steel elements using steels with weathering characteristics as defined in ASTM A709 for grades with a "W" suffix.

Structural components designated as "fracture critical" shall conform to the provisions of the AASHTO/AWS D1.5, Bridge Welding Code, Clause 12-AASHTO/AWS Fracture Critical Control Plan for Non-Redundant Members, in addition to the requirements of the Contract Documents.

Meet the additional following requirements:

Steel and Miscellaneous Metal Items .....Section 962
Material Testing and Certifications .....Section 962
Galvanizing .....Section 962
Structural Coatings.....Section 560
Structural Coating Materials .....Section 975

460-3 Pre-Assembly Requirements.

460-3.1 Shop Drawings: When shop drawings are required, submit such drawings in accordance with Section 5. For drawing presentation format, refer to the AASHTO/NSBA Steel Bridge Collaboration "Guidelines for Shop Detail Drawing Presentation".

460-3.2 Welding Procedures: Submit all shop and field welding procedures to the Engineer. Such procedures shall contain a notation that they have been reviewed by a Certified Welding Inspector, and shall be signed, dated and stamped accordingly.

460-3.3 Pre-Assembly Meeting: Prior to commencing work, a meeting shall be held between the Contractor and the Engineer. Representatives of the Fabricator, Suppliers or subcontractors may attend the meeting if requested by the Engineer or Contractor. During this meeting, the Engineer may review various aspects of the job, including but not limited to, any of the following:

1. Plant and Personnel Certification.
2. Organizational Structure of Contractor personnel.
3. Traceability of Materials to Pre-Qualified Fabricator.
4. Shop Drawing requirements, submittal, review and approval process.
5. Fabrication Procedures, especially shop assembly, welding and painting.
6. Sampling and Testing Procedures.
7. Project specific areas of concern for fabrication, inspection and testing.
8. Handling of Material Test Reports.
9. Work Schedule.
10. Lines of Communication.
11. Availability of Quality Control and Verification Inspectors during specific fabrication/erection operations.
12. Loading and Transporting.
13. Handling of non-conformance and repair issues.
14. Special Requirements.
15. Consistency between fabrication shop drawings and the Erection Plan, specifically between the fabrication shop blocking diagrams and available site locations for temporary support during erection.

460-3.4 Access to Fabrication Facilities: Provide the Engineer full access of facilities or sites where the product is being stored, fabricated, assembled, coated or erected.

Provide and maintain office facilities at the fabrication facility for the City's inspectors that ensure a reasonable amount of privacy, are clean, properly illuminated, heated or air-conditioned as necessary and are relatively free of noise, dust and odors. Locate the office reasonably close to the work and provide access any time fabrication, assembly or erection operations are in progress. Provide a desk, chair, and a four-drawer locking file cabinet for the use by each inspector and the Engineer. Provide a telephone within the office with an outside line suitable for modem communication. Provide ready access to adequate

parking, fax and copy machines, and clean, contractor-maintained restrooms within a reasonable distance to the office.

The Engineer may observe any or all activities and perform nondestructive testing of materials, components and the fabricated product to the extent considered necessary to confirm the conformance with Contract Documents.

460-3.5 Notification Prior to Commencement of Assembly: Notify the Engineer at least one week prior to beginning assembly, when conducted in-state, and at least two weeks prior to beginning assembly, when conducted out-of-state.

460-4 Shop Workmanship and Assembly.

460-4.1 Handling, Transporting and Storage of Materials:

460-4.1.1 General: Handle, transport and store plates, shapes, assemblies, fastener components and other parts in a manner that protects them from damage and facilitates subsequent inspections in a safe manner.

Provide storage which will keep materials, assemblies, other components and parts clean, and free from dirt, grease, other foreign matter, unacceptable corrosion or coating deterioration, and any other adverse environmental conditions.

460-4.1.2 Bulk Materials: Ensure that all bulk materials, such as shear studs, are stored together in individual LOTs and that the outside of each container has a list and description of the contents. Maintain a separate list of the weights of all tools and erection materials.

460-4.1.3 Fastener Assemblies (Bolts, Nuts and Washers): Transport and store fastener assemblies in sealed, watertight containers. Label the side of each container with the supplier's name and LOT identification number, and marked to identify the contents and size of the fastener components. Ensure that all surfaces of the nuts are lubricated prior to their placement in watertight containers. Provide containers for components that are capable of protecting them from moisture and other harmful materials. Maintain containers in their sealed conditions until they are opened for use at their assembly locations.

Do not remove more fastener assemblies from the protected area than can be installed and tightened during a work shift. Leave the containers unopened until needed for assembly. At the end of the work shift, return unused fastener assemblies to the protected storage area for future use. Protect opened storage containers from contamination.

460-4.1.4 Coatings: Store coatings in accordance with Sections 962, and 975 and the manufacturer's recommendations. Notify the Engineer if the manufacturer's recommendations vary from that provided in the Contract Documents.

460-4.1.5 Anchor Rods and Nuts: Ship anchor rods and nuts as an assembly. Washers may be shipped separate from the assembly.

460-4.2 Material Traceability:

460-4.2.1 General: All materials arriving at the shop shall be properly identified in accordance the requirements of ASTM A6. Document all main load-carrying member material, high-strength fastener assemblies, and weld materials incorporated into the work through the entire fabrication process. Document this material traceability in a report type format that correlates heat numbers to their respective locations in the completed members. Submit diagrams and sketches as requested by the Engineer for clarity.

At the fabrication facility, maintain the records of the material testing and certification processes and component/part identification as part of the fabricator's permanent

project records for a period of not less than two years as measured from the last shipment of materials from the fabricator's facility. Submit all project-related records to the Engineer.

Mark the weight on members weighing more than three tons, in a visible location.

460-4.2.2 Match Marking of Members and Assemblies: Match mark all connecting members or parts that have been reamed or drilled while assembled. The fabricator shall submit a diagram showing all marks and clearly indicate the location of all the marks on the shop drawings.

Use painted marks, attached metal tags, other durable methods which do not degrade the finish of the piece, or low-stress type steel die stamps to identify and match mark pieces. If steel die stamps are used, they must be blunt nosed or interrupted dot dies, manufactured to produce impressions that are rounded at the bottom of the impression. Re-mark coated type markings as necessary to maintain continuity in traceability.

Mark splice plates and girders so that upon erection, the mark on the splice plate is located opposite a matching mark on the girder. Place the mark on web splice plates, midway down the long side of the plate, on either the right or left side, to correspond with the girder to which the splice plate will be temporarily attached for shipping to the erection site.

Make a matching stamp on the girder web opposite the mark on the splice plate.

Place the mark on top or bottom flange splice plates, on the right or left end of the plate, corresponding to the girder to which the plate will be attached for shipment to the erection site. Place a corresponding mark on the girder flange opposite the mark in the splice plate.

As an alternate location for tub girder bottom flange splice plates, place the mark midway down the long side of the plate, on either the right or left side, to correspond with the girder to which the splice plate will be temporarily attached for shipping to the erection site. Make a matching mark on the girder flange opposite the mark on the splice plate.

Mark girders and beams on the left end, according to the orientation shown in the shop drawings, near the top flange. Mark diaphragms in the middle upper portion of the web. Mark cross-frames in the middle of the top or bottom horizontal member.

When heat numbers and other identification marking are applied by die stamping to fracture critical members, low stress dies shall be used.

Low-stress die stamp markings applied to fracture critical members shall be placed in locations or zones shown or described in the approved shop drawings. Low-stress or compression areas are preferred.

Ensure that during fabrication, the heat number is maintained on each primary load-carrying component by paint until the component is permanently joined into a piece marked member or assembly.

460-4.3 Workmanship:

460-4.3.1 Cutting, Shearing and Machining: Cutting (including burning and sawing), shearing, and machining shall be accomplished in accordance with the AASHTO/AWS 1.5, Bridge Welding Code and the following requirements:

Plane, mill, grind or thermally cut the sheared edges of main load-carrying member plate components greater than 5/8 inch thick to a depth of 1/4 inch.

Cut and fabricate steel plates so that the primary direction of rolling is parallel to the direction of the member or component main stress. For flanges and webs, the direction of rolling is parallel to the flanges unless noted otherwise in the Contract Documents. Web splice plates may be rolled parallel to their length.

460-4.3.2 Bending:

460-4.3.2.1 Cold Bending: Fracture critical and non fracture critical plates and bars shall be cold bent, unless otherwise permitted according to the provisions of Section 460-4.3.2.2.

The minimum bend radii measured to the concave face of the plate, shall be taken as 5.0(t) for all grades and thicknesses of steel conforming to structural steel for bridges, AASHTO M270M/M 270 (ASTM A709/A709M), where 't' is the thickness of the plate in inches. For cross-frame or diaphragm connection plates up to 0.75 inches, the minimum bending radii may be taken as 1.5(t). For all other grades of steel the minimum bend radii recommendations from the plate fabricator shall be followed, but the radii shall not be less than the minimums specified herein.

Wherever possible, bend lines shall be oriented perpendicular to the direction of final rolling of the plate. If the bend lines are parallel to the direction of final rolling, the minimum bend radii shall be increased to 7.5(t).

460-4.3.2.2 Hot Bending: Fracture critical and non-fracture critical plates and bars may be bent hot subject to the approval of the Engineer. Heat-shrink methods as described in 460-4.3.4 are also permitted. If hot bending is to be employed, the heating and bending procedure shall be submitted for review and approval by the Engineer. The plates and bars shall be bent hot at a temperature above the blue brittle temperature of steel (700° F), not to exceed the temperature limits in Table 460-2. The minimum radii of the hot bend must satisfy the requirements of 460-4.3.2.1.

460-4.3.3 Straightening: Member components, such as plates, angles or shapes, are to be straightened before the parts are assembled. Perform straightening such that no cracking or other damage occurs in the part. If heat is to be used for straightening, follow the provisions of
460-4.3.4.

460-4.3.4 Heat Application:

460-4.3.4.1 General: At various points during the fabrication of structural steel, applications of heat may be necessary for hot-bending, cambering, curving or straightening. Use the temperature limits and guidelines given in this Section, unless alternate procedures have been approved by the Engineer. Routine straightening of material other than quenched and tempered material shall be done in accordance with the temperature limits and guidelines as specified herein, but do not require a submitted procedure.

Heat curving may be used in conjunction with a cut-curve procedure, in which a portion of the curvature is obtained by cutting the plates to all or part of the required radius, except as limited by 460-4.3.4.4.

460-4.3.4.2 Heating Process and Equipment:

460-4.3.4.2.1 Maximum Temperatures: The maximum allowable temperature to which the material can be heated is given in Table 460-2, Maximum Temperature Limits for Heat Applications.

Table 460-2
Maximum Temperature Limits for Heat Applications

ASTM A 709 Grade	Maximum Temperature, °F
36, 50, 50S, 50W & HPS 50W	1,200

Table 460-2 Maximum Temperature Limits for Heat Applications	
HPS 70W & HPS 100W	1,100

460-4.3.4.2.2 Timing of Heat Applications: Conduct heating operations prior to the application of coatings.

460-4.3.4.2.3 Allowable Preload Stresses: Preload compressive stresses will be permitted up to 0.5 times the minimum specified yield strength (Fy) of the material. This stress limit is applicable to all steels covered by this specification as listed in Table 460-2. If jacks are used, energize and lock off prior to the application of heat.

460-4.3.4.2.4 Heating Tips: Apply heat using orifice tips only. Select tip sizes proportional to the thickness of the heated material.

460-4.3.4.2.5 Torches: Manipulate the heating torches to guard against general and surface overheating. In addition, place heat reflective sheet material against the web before applying heat to the inside flange surface. When heating the inside flange surface, point the torches to prevent applying heat directly to the web.

460-4.3.4.2.6 Heating Patterns: Fundamental heating patterns (such as vee, line, edge, spot, and strip) may be used separately or in combination. Mark vee and strip heat patterns on the material surfaces prior to heating. When heating, bring the steel within the planned pattern to the specified heating temperature as rapidly as possible without overheating the steel. Apply heat in accordance with the approved procedure.

460-4.3.4.2.7 Thin Wide Plates: Prevent buckling of thin wide plates by not applying excessive heat.

460-4.3.4.2.8 Verification of Temperatures: Use temperature-sensitive crayons, pyrometers, or infrared non-contact thermometers for verifying temperatures during heating operations. When heating patterns are used, make regular verifications of the temperatures throughout the pattern. Remove the heating flame from the material before taking measurements.

460-4.3.4.2.9 Cooling: Prior to the use of any artificial cooling, allow steel to cool below 600°F. Use only dry compressed air. Do not quench with water or a water and air mixture.

460-4.3.4.2.10 Reheating: Reheat only after the material has cooled below 250°F.

460-4.3.4.2.11 Over Heating: The Engineer may reject the product, if any portion of the material is exposed to heating higher than the allowable temperature.

460-4.3.4.3 Heat-Curving of Bridge Members (Weak Axis Shaping):

460-4.3.4.3.1 General: Rolled beams and girders may be heat-curved at the job site, provided that the heating is performed in accordance with the Engineer's approval.

460-4.3.4.3.2 Sequence of Operations: Heat curve members prior to the attachment of longitudinal stiffeners.

460-4.3.4.3.3 Web Position: When the radius is less than 1,000 feet, heat curve members with the web in the horizontal position or preloaded to induce stress prior to heating. Otherwise, members may be heat-curved with the web in either the vertical or horizontal position.

460-4.3.4.3.4 Subsequent Heats: If multiple locations are to be heated, do not reheat the same location until after at least three heats at other locations.

460-4.3.4.3.5 Locating Heating Patterns: Space the heating patterns along the full length of each flange to produce a circular (not parabolic) curvature. Adjust the heating patterns to produce the necessary curvature. Compensate for differences in flange thickness and width as necessary. Use enough heating patterns in each piece to eliminate chording effects.

460-4.3.4.4 Minimum Radius for Heat-Curving: Heat-curving of beams and girders is allowed when the horizontal radius of curvature measured to the centerline of the member web is greater than both values calculated by Equations 4.1 and 4.2 below, and greater than 150 feet at any and all cross sections throughout the length of the member. Do not heat curve steels with a minimum specified yield strength greater than 50 ksi, other than ASTM A709, Grade HPS 70W.

$$R = \frac{14bD}{\sqrt{F_y \psi t}} \text{ in.} \qquad \text{(Equation 4.1)}$$

$$R = \frac{7500b}{F_y \psi} \text{ in.} \qquad \text{(Equation 4.2)}$$

where:

Fy = specified minimum yield point of member web, ksi;
ψ = ratio of the total cross section area to the cross-sectional area of both flanges;
b = width of the widest flange, inch;
D = clear distance between flanges, inch;
t = web thickness, inch;
R = radius, inch.

In addition to the above requirements, do not heat curve if the radius is less than 1,000 feet when the flange thickness exceeds 3 inches or the flange width exceeds 30 inches.

460-4.3.4.5 Heat-Cambering (Strong Axis Shaping):

460-4.3.4.5.1 General: Procedures for cambering of built-up plate girders shall be submitted as a part of the Producer Quality Control (QC) Plan. In the procedures, address any proposed preloading and heat application and control. Minor heat adjustments in camber at the finishing stage of the girder do not require approval if the patterns and temperatures are followed in accordance with the approved procedures.

Do not utilize heat-cambering as the primary source of vertical camber in horizontally curved main load-carrying members; cut the web plate to the required position. Only use heat-cambering on horizontally curved main members to adjust cut cambering with the approval of the Engineer.

460-4.3.4.5.2 Web Position: Support members to be heat-cambered with the web vertical. Space supports to take maximum advantage of dead load in the member prior to the application of heat.

460-4.3.4.5.3 Subsequent Heats: If multiple locations are to be heated, do not reheat the same location until after at least three heats at other locations.

460-4.3.4.5.4 Rolled Beams: Rolled beams may be heat-cambered to provide the required curvature at the producing mill. Attach all detail material, such as connection plates, bearing stiffeners and gusset plates, after the beam has been heat-cambered.

460-4.3.4.6 Heat-Straightening Damaged Structural Steel:

460-4.3.4.6.1 General: Submit procedures for heat-straightening for the Engineer's review prior to beginning the work. Describe in detail the distortion to be corrected and all details for preloading, heating, cooling, verifying final dimensions, and nondestructive testing.

460-4.3.4.6.2 Cracking: As a minimum, visually examine all heat-straightened areas. Notify the Engineer when suspected areas of cracking are found. Examine these areas by one or more of the following methods, as directed by the Engineer:

1. Visual examination;
2. Liquid penetrant examination
3. Magnetic particle examination
4. Ultrasonic examination
5. Radiographic examination

460-4.3.4.6.3 Restraining Forces: Restraining forces (usually jacks) shall be set to restrain the steel during heating, but allow free contraction during cooling.

In addition, apply the restraining forces in a direction tending to restore the member and limit the magnitude so that the material is not overstressed during heating.

460-4.3.4.6.4 Heating: Heat the steel in a single pass following the specified pattern and allow it to cool to below 250°F prior to reheating. Select heating patterns and sequences appropriate for the type of damage and shape of the cross section. Simultaneous vee heats may be used provided the clear spacing between vees is greater than the width of the plate element.

460-4.3.4.6.5 Subsequent Repair: Heat cambered members damaged after cambering may be repaired. However, do not repair previously heat-straightened members in the same region of damage without the approval of the Engineer.

460-4.3.4.7 Heat Treatment:

460-4.3.4.7.1 General: When any special form of heat treatment is required, it will be described in the Contract Documents. Perform heat treatments prior to any boring, machining or straightening operations.

460-4.3.4.7.2 Stress Relief: Where required, perform thermal stress relief in accordance with the procedure outlined in the AASHTO/AWS D1.5, Bridge Welding Code. Provide welding materials consistent with the stress relieving process utilized.

460-4.3.4.7.3 Normalizing and Annealing: Where required by the Contract Documents, perform normalizing and annealing as defined in ASTM A941. Maintain temperatures uniformly throughout the furnace during heating and cooling so that the temperatures at any points on the member do not differ by more than 130°F.

460-4.3.4.8 Contact and Bearing Surfaces: Provide surface finishes of bearings, base plates, and other contact surfaces in accordance with the ANSI surface roughness requirements as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I, given in Table 460-5, ANSI Surface Roughness Requirements.

cracks, fins, dirt, loose rust, burrs or other anomalies, and the surface is to be flat within a slope

Table 460-5 ANSI Surface Roughness Requirements	
Steel slabs	ANSI 2000 micro-inch
Heavy plates in contact with shoes to be welded	ANSI 1000 micro-inch
Milled ends to compression members, milled or ground ends of stiffeners or rockers	ANSI 500 micro-inch
Bridge rollers and rockers	ANSI 250 micro-inch
Sliding bearings	ANSI 125 micro-inch
Pins and pin holes	ANSI 125 micro-inch

460-4.3.4.9 Cleaning and Coating (Including Galvanizing):

460-4.3.4.9.1 General: Clean and coat the work in accordance with 460-2 and/or 460-7.2 and Sections 560, and 562.

460-4.3.4.9.2 Removal of Lubricants: Remove lubricants from the exposed surfaces of installed fastener assemblies and other surfaces in accordance with the approved Producer QC Plan or the paint manufacturer's recommendations prior to painting. Demonstrate the procedures to the Engineer prior to preparations for painting. Bring to the Engineer's attention any manufacturer's processes or procedures that conflict with those
specified in the Contract Documents.

460-4.3.5 Bolt Holes:

460-4.3.5.1 General: Unless shown otherwise in the Contract Documents, the bolt hole geometry is to be as shown in Table 460-3, Bolt Hole Geometry.

Table 460-3 Bolt Hole Geometry				
Bolt Diameter (d), inch	Standard (Diameter, inch)	Oversize (Diameter, inch)	Short-Slotted (Width, inch by Length, inch)	Long-Slotted (Width, inch by Length, inch)
1/2	9/16	5/8	9/16 x 11/16	9/16 x 1 1/4
5/8	11/16	13/16	11/16 x 7/8	11/16 x 1 9/16
3/4	13/16	15/16	13/16 x 1	13/16 x 1 7/8
7/8	15/16	1 1/16	15/16 x 1 1/8	15/16 x 2 3/16
1	1 1/16	1 1/4	1 1/16 x 1 5/16	1 1/16 x 2 1/2
> 1 1/8	d + 1/16	D + 5/16	(d + 1/16) x (d + 3/8)	(d + 1/16) x (2.5 x d)
Note: Except as shown elsewhere in the Contract Documents, bolt holes in the connections of primary members are to be standard size.				

460-4.3.5.2 Holes, Tolerances and Quality: Make bolt (and anchor rod) holes using any method suitable to the Fabricator and as specified below; except holes for high strength fasteners in main or primary load-carrying members which are not to be punched full size, but may be thermally cut in accordance with 460-4.3.5.4 and ground smooth with the approval of the Engineer.

The misalignment of holes in a bolt group relative to the same holes in the component or components it is joined to in a connection, shall not exceed 1/32 inch

cracks, fins, dirt, loose rust, burrs or other anomalies, and the surface is to be flat within a slope for 85% of the bolt holes in that group. Bolt holes are to be normal to the work and have no tears,
of 1/20. Bolt holes are to be round within plus or minus 1/32 inch and within plus or minus 1/32 inch of the specified size. For subsize holes, a pin 1/8 inch smaller than the subsize holes must be able to pass through all assembled plies in at least 75% of the locations prior to reaming. Holes inclined more than 3 degrees to a surface in any direction must have a hardened beveled washer provided at that face. Unless specified elsewhere in the Contract Documents, it is not required to coat the inside of the bolt holes.

460-4.3.5.3 Slotted Holes: Slots may be made by a single punch, or by joining two adjacent drilled or punched holes when punching is permitted. When joining holes, thermal cutting is to follow the common tangent to the two holes, and this cut is to be ground. Do not make slotted holes more than 1/32 inch in width nor 1/16 inch greater in length than specified. Grind smooth any flame cut portions of the slot to ANSI 1000 micro-inches.

460-4.3.5.4 Holes in Plates Not Subjected to Tensile Stress: Large diameter holes in heavy plates not subjected to tensile stress (such as bearing plates) and slotted holes in materials not subject to tensile stress may be thermally cut, followed by appropriate grinding to smooth the periphery. Stop the practice if gouges or other defects occur, or if directed by the Engineer. These holes are to meet the following criteria:

Do not thermally cut holes in ASTM A709, GradeHPS 100W steel. Provide hole centerlines aligned within plus or minus 1/16 inch of theoretical. The inside (cut) faces of the hole are to be perpendicular to the plane of the plate. Eighty-five percent of the (open) hole diameter is not to exceed that specified in the Contract Documents, plus or minus 1/16 inch. Local notches, gouges or the maximum diameter shall not exceed that specified in the Contract Documents plus or minus 3/32 inch.

460-4.3.5.5 Punching: Material forming parts of a member composed of five thicknesses or less of metal may be punched full-size. When more than five thicknesses of material are joined, material shall be subdrilled or subpunched and then reamed full-size, or drilled full-size while in assembly. Subpunched or subdrilled holes, when required, must be at least 3/16 inches smaller than the finished hole size.

Holes in cross frames, lateral bracing components, and the corresponding holes in connection plates between girders and cross frames or lateral components may be punched full size. Holes in longitudinal main load-carrying members, transverse floorbeams, and any components designated as fracture critical (FCMs) shall not be punched
full-size.

460-4.3.5.6 Edge Distance: Provide minimum as-fabricated distance from the center of a bolt hole to an edge as given in Table 460-4, Edge Distances.

Table 460-4
Edge Distances

Fastener Size, Inch	Sheared Edge, Inch	Rolled Edges of Plates or Shapes or Gas Cut Edges Inch
5/8	1 1/8	7/8
3/4	1 1/4	1
7/8	1 1/2	1 1/8
1	1 3/4	1 1/4

Documents, the tolerance for bolted splice gaps (open distance face-of-web/flange to face-of-web/flange) shall be from zero (no gap between faces) to a maximum of 1/8 inch greater than the gap shown on the Contract Plans. If no gap is shown in the Contract Plans, assume that a nominal gap of 3/8 inch is required. In addition, meet the edge distance requirements, provided above.

460-4.3.5.8 Maximum Edge Distance: Unless otherwise specified in the Contract Documents, the maximum fabricated distance from any edge to the center of the hole shall be 8 times the thickness of the thinnest outside plate, not to exceed 5 inches with no additional tolerance allowed.

460-4.3.5.9 Spacing of Bolt Holes: Space bolt holes within plus or minus 3/16 inch of that shown in the Contract Documents.

460-4.3.5.10 Holding of Plies: When drilling or reaming is accomplished through multiple plies of material, do not hold the materials together by welds not specified in the Contract Drawings.

460-4.4 Member Geometry:

460-4.4.1 General:

460-4.4.1.1 Tolerances: Provide dimensional tolerances as follows:

1. Rolled shapes, plates, bars, wide flange sections and miscellaneous steel in accordance with ASTM A6;
2. Fabricate girders in accordance with the AASHTO/AWS D1.5, Bridge Welding Code and as described below;
3. For built-up members not specifically covered by AASHTO/AWS D1.5, apply AASHTO/AWS D1.5, Bridge Welding Code, except as noted below or as directed by the Engineer.

460-4.4.1.2 Camber and Sweep: Tolerances for camber and sweep of continuous and simply supported girders of any shape shall be as described in the AASHTO/AWS D1.5, Bridge Welding Code. The camber and sweep tolerances for steel pier caps shall be the same as those specified for girders. Measure sweep for horizontally curved members from the theoretical centerline for comparison to the aforementioned requirements.

460-4.4.1.3 Alternate Sections: Rolled sections or fabricated sections of equal or slightly greater dimensions than the section specified may be proposed for the Engineer's approval. Changes that reduce fatigue resistance or significantly affect splice design or deflection will require complete design calculations.

460-4.4.1.4 Web Flatness: Maximum deviation from flatness for webs of curved and/or cambered sections shall be the same as for straight built-up girders. Measure curved girder web flatness using a straightedge oriented perpendicular to the flanges ("vertical", flange to flange).

460-4.4.1.5 Girder Length: If measuring girder length with a device that is free of thermal effects, appropriately adjust the measurements to the reference temperature shown in the Contract Documents. Measure the length of horizontally curved girders along the arc.

460-4.4.2 Specialty Structures:

460-4.4.2.1 Box Members as Bent Caps:

460-4.4.2.1.1 Tolerances: Unless otherwise shown in the Contract Documents, submit tolerances for bearing planes and box twist to the Engineer for review and approval. Prior to submitting these tolerance values for approval, coordinate between the Erector and the Fabricator.

460-4.4.2.1.2 Bearings: Unless otherwise specified in the Contract Documents, each bearing is to be true to a tolerance of 1/32 inch across its entire width in either direction.

460-4.4.2.1.3 Beam Trueness: Unless otherwise specified in the Contract Documents, the plane of beam supports on the box girder (the bearing area specifically attached to the box girder) is to be true to the box girder bearing within 1/16 inch in the short direction and true to the vertical axis of the nesting girders (those girders attached to or resting on the box girder) within 1/16 inch.

460-4.4.2.2 Trapezoidal Bridge Members: As a minimum, trapezoidal bridge members (tub or box girders) shall meet AASHTO/AWS D1.5, Bridge Welding Code dimensional tolerances. Camber may be verified with the girder in its upright position, supported to avoid dead load deflections.

460-4.4.2.3 Pinholes: Unless shown elsewhere in the Contract Documents, bore pinholes:

1. True to the specified diameter;
2. Smooth to ANSI 3 (125 micro-inches);
3. At right angles with the axis of the member;
4. Parallel with each other; and
5. With a diameter of the pinhole not exceeding that of the pin by more than 0.015 inch for pins 5 inches or less in diameter, or 1/32 inch for larger pins.

460-4.4.2.4 Truss Chord Joints: Abutting joints in truss chords not specified to be mill-to-bear shall have openings of 1/4 inch, plus or minus 1/8 inch.

Abutting joints in truss chords specified to be mill-to-bear shall be faced and brought into bearing. When assembled, provide 85% or more of the abutting surfaces in full contact. Allowable visible gaps shall not exceed 1/64 inch.

460-4.4.2.5 Horizontally Curved Beams and Skewed Steel Girders: Account for torsion induced deflections for horizontally curved beams and skewed steel girders. Unless otherwise defined in the Contract Documents, a horizontally curved beam or girder is a longitudinal or transverse bridge component with a radius less than 10,000 feet anywhere along its continuous length.

460-4.5 Shop Assembly:

460-4.5.1 General: Ensure the fit of all connections and the geometry of all components. Unless specified elsewhere in the Contract Documents, check the fit of all longitudinal girder/beam lines in accordance with 460-4.5.1.1. Perform this prior to transporting the pieces in question to the site for erection.

460-4.5.1.1 Progressive Girder or Truss Assembly: Assemble the structure for a minimum of three spans, panels, field sections, segments or longitudinal chords of the structure. Successive assemblies shall consist of at least one longitudinal segment of the previous assembly, repositioned as necessary for accurate alignment, plus two or more longitudinal segments added at the advancing end. For entire structures less than 150 feet in length or less than three segments, assemble the entire longitudinal line. Meet the requirements of 460-4.5.1.4 when utilizing computer-numerically-controlled drilling equipment.

When a transverse structural steel member or members is required for the continuation of the uninterrupted girder or beam line, truss, arch rib, bent tower face or rigid frame, and is designated elsewhere in the Contract Documents to be shop assembled, the Fabricator may include this member or component in a separate subassembly and not the three segment longitudinal assembly (discussed above). If combined in a different subassembly, include the longitudinal member(s) or component(s), as designated elsewhere in the Contract Documents to be shop assembled, that frame directly into the transverse

structural member. Do not include the transverse member(s) in the longitudinal assembly unless directed so elsewhere in the Contract Documents or by the Engineer. Account for end rotations and deflections as necessary, and submit the procedure to the Engineer for review.

460-4.5.1.2 Progressive Chord Assembly: When specified elsewhere in the Contract Documents, assemble the truss chords for a minimum of three panels or longitudinal segments of the structure. Successive assemblies shall consist of at least one longitudinal segment of the previous assembly, repositioned as necessary for accurate alignment, plus two or more longitudinal segments added at the advancing end. For entire structures less than 150 feet in length or less than three segments, assemble the entire longitudinal line. Meet the requirements of 460-4.5.1.4 when using computer-numerically-controlled drilling equipment.

Account for transverse members indicted elsewhere in the Contract Documents to be included in the shop assembly as in 460-4.5.1.1.

When assembled in accordance with this subsection, the holes of the connections will be so located that they will be drilled to the final geometric angles. This will require that the truss members, when erected under the no load (or practically no load or stress) condition, must be bent and forced to fit the end conditions. This condition will introduce an initial reverse secondary stress that will theoretically wane when the structure assumes the loading for which it is cambered. Submit the procedure to the Engineer for review.

460-4.5.1.3 Special Complete Structure Assembly: When specified elsewhere in the Contract Documents, this type of shop assembly will include assembling the entire structure including the diaphragms, cross frames, integral steel substructure and floor components. Miscellaneous components are not included unless directed elsewhere in the Contract Documents. Establish procedures for each structure or structure type including consideration of incremental erection, temporary field support locations, stage construction and final tightening of field connections. Submit the procedures for review by the Engineer.

460-4.5.1.4 Computer-Numerically-Controlled (CNC) Drilling Associated with Progressive Girder, Truss or Chord Assembly: If the Fabricator chooses to drill the holes in all plies of all connections of the continuous main girder or beam line, truss, arch rib, bent, tower face or rigid frame and any intersecting (transverse) members utilizing computer-controlled-numerical drilling procedures, piece-wise assembly of the entire continuous girder or beam line, truss, arch rib, bent, tower face or rigid frame is not required if the following requirements are met:

Prior to transporting to the site, perform a check fit of the first three spans, panels, field sections, segments or longitudinal chords; or entire first bent, tower face or rigid frame of the structure to ensure the accuracy of the CNC procedures and equipment.

As selected by and at the discretion of the Engineer and prior to transporting to the site, perform another check fit of a different assembly of three spans, panels, field sections, segments or longitudinal chords; or another entire bent, tower face or rigid frame of the structure to ensure that the accuracy of the CNC procedures and equipment is maintained. If either of the above fails to meet the Contract requirements, assemble the entire girder or beam line, truss, arch rib, bent, tower face or rigid frame as originally prescribed in 460-4.5.1.1 or 460-

4.5.1.2 as prescribed elsewhere in the Contract Documents. Account for transverse members indicated elsewhere in the Contract Documents to be included in the shop assembly as in 460-
4.5.1.1.

460-4.6 Evaluation of Work: The Engineer will evaluate and accept materials and work conforming to the Contract Documents. These evaluations may take place prior to or following delivery of the materials to the site of the structure. Materials or work that fails to meet Contract requirements will be rejected.

The Engineer may, at his sole discretion, permit further inspections and testing of materials or work that fail to meet Contract requirements for acceptance. The cost of such inspections and tests shall be borne by the Contractor.

Bring to the attention of the Engineer, all nonconforming work and or materials that cannot be brought into conformance with the Contract Documents using pre-established procedures as outlined in the City approved Producer QC Plan. Submit the following information to the Engineer:

A cover letter prepared on the Contractor's letterhead and addressed to the Engineer briefly describing the nonconforming work and the proposed credit to the Contract proportionate to the nonconformance. For each fabricating facility and for each project within that fabrication facility, submittals must be numbered consecutively beginning with the number
1, at the start of each project. Erectors will start with one for each individual project.

A completed City Nonconforming Structural Steel and Miscellaneous Metal Component Data Sheet prepared by the Contractor and countersigned by the Engineer's designated representative to indicate agreement between the Contractor and the City regarding the nonconformance, not any solution, resolution or credit. If the Contractor and the Engineer's designated representative are not in agreement regarding the nonconformance, the Engineer's designated representative will either reject the submittal indicating the reason(s) for the rejection or modify the submittal and forward to the Engineer. In the event of modification, the Contractor will initial the submittal before being forwarded to the Engineer, thereby indicating the Contractor's concurrence with the modification.

A list of supporting information such as sketches, documentation, calculations, pictures, etc., must be included in the appropriate space on the Nonconforming Component Data Sheet. Supporting information regarding Contract Document noncompliance in the form of separate documents is only necessary when space on the City Nonconforming Structural Steel and Miscellaneous Metal Component Data Sheet is inadequate for the required data. All of the supporting information required for the form must be prepared by, or under the supervision of, the Specialty Engineer who will sign and seal the supporting information.

If requested by the Engineer, submit a structural and durability evaluation of the proposed repair and/or remediation. This evaluation must be conducted under the supervision of a Specialty Engineer and the submittal is to bear the Specialty Engineer's signature and seal.

460-4.7 Member or Component Certification: Coordinate with the Engineer to schedule final inspection of the completed work within two weeks prior to shipment or erection to verify that all Contract Document requirements have been met. After verification that all Contract Document requirements have been met and all necessary repairs have been satisfactorily completed, the Quality Control Manager shall certify, by initials and/or signature, such materials, components or members. The record shall include certification for:

1.Items being shipped or stored prior to final assembly. Affix a certification in the form of a stamp or tag in accordance with 460-4.2 and as indicated in the Producer Q C Plan, and with a copy of the certification placed in the Contractor's permanent project records,

2. Work being placed into its final position. Document in the Contractor's permanent project records.

Submit a summary certification at the least once a month or with each payment request that includes the following or similar wording. "The undersigned, being a responsible official of (insert Contractor identification) certifies that the materials, components or members listed herein have been produced under strict quality control and meet the requirements of the Contract Documents" Include a positive identification in the certification such that the applicable materials, components and/or members can be uniquely identified utilizing just the summary certification document. The Quality Control Manager shall sign this summary certification.

460-5 Bolted Connections.

460-5.1 General: Use bolts as follows:

1. Use galvanized ASTM A325 Type 1 bolts in all field installed bolted structural steel connections for painted steel.

2. Use either black or galvanized ASTM A325 Type 1 bolts in all shop installed bolted structural steel connections that will be shop painted.

3. Use black ASTM A325 Type 3 bolts in all bolted structural steel connections for weathering steel that is to remain unpainted.

4. Use the bolts as specified for connected assemblies or parts that are designated as miscellaneous components where the fastener type is specified elsewhere in the Contract Documents.

Tighten ASTM A325 bolts in accordance with the procedures specified below for turn-of-nut or direct-tension-indicator (DTI) tightening.

Lubricate and maintain consistency in lubrication of fastener assembly during Rotational Capacity (RC) testing and installation. Assemblies that exhibit a loss of lubrication, as determined by the Engineer, may be re-lubricated and retested prior to installation.

Use ASTM A490 bolts only with the approval of the Engineer. Submit procedures in accordance with ASTM A490 for the handling, lubrication, installation, tightening and testing of such bolts. Do not install ASTM A490 bolts without prior approval of the procedures by the Engineer.

When the Engineer approves ASTM A307 bolts for use in miscellaneous components, tighten them such that the plies of the joint are in firm contact. Use three to five impacts of an impact wrench or the full effort of a person using an ordinary spud wrench to obtain a snug connection.

Fasten aluminum, other materials or assemblies of dissimilar materials in accordance with the Contract Documents.

Install ordinary rough or machine bolts and nuts in accordance with the Contract Documents.

460-5.2 Testing:

460-5.2.1 Rotational Capacity (RC) Tests: At the location of and prior to installation of permanent high-strength fasteners in main or primary load-carrying member connections, perform RC tests in accordance with FM 5-581 (for long bolts) or FM 5-582 (for short bolts) to ensure that the fasteners are capable of developing the specified strength and that the fasteners are properly lubricated. As a minimum, test two assemblies per LOT designation.

The bolt, nut and washer shall come from the same LOT and be packed in the same container (or group of containers assigned the same LOT), except in special cases where nuts and washers have only one production LOT number for each size.

Short bolts may also be tested using FM 5-583 with DTIs calibrated with long bolts installed in a Tension Measuring Device.

Washers are required for RC tests even though they may not be required for jobsite installation. Where washers are not required for jobsite installation, LOT identification is not required. The washer coating shall be the same as that for the bolt and nut.

If any of the required tests fails, the entire LOT will be rejected.

460-5.2.2 Verification of Direct Tension Indicator (DTI) Device Performance: On a daily basis (when DTI devices are being installed) and at the location of installation, perform DTI Verification tests in accordance with FM 5-583. Perform this test on a minimum of two high-strength fastener assemblies from each fastener assembly LOT and position of the DTI prior to production installation. If either assembly fails, test additional fastener assembly LOT/DTI combinations as requested by the Engineer to verify that the Requirements of the Contract Documents have been satisfied. These two tests are in addition to the RC tests required in 460-5.2.1. If, after additional testing, the DTI fails to meet the requirements of FM 5-583, the LOT will be rejected by the Engineer.

460-5.3 Reuse and Retightening: Do not reuse ASTM A490 bolts or galvanized ASTM A325 bolts. Black ASTM A325 bolts with free spinning nuts may be reused one time with the Engineer's approval. Previously tightened bolts that may have been loosened by the tightening of adjacent bolts can be further tightened from the original position. Ensure proper lubrication prior to retightening. Discard and replace fractured or damaged bolts.

460-5.4 Assembly of Bolted Connections:

460-5.4.1 General: Verify that the faying surfaces are in accordance with the Contract Documents, are free of dirt or other foreign materials, and that the geometry of the bolt holes and the connection meets the requirements of 460-4.3.4.9.

Install fastener assembly components of the same LOT and of the size and quality specified in the Contract Documents. Provide final bolts, cylindrical erection pins or other fit-up bolts as indicated in the Erection Plan.

When it is impractical to turn the nut, tighten the fastener by turning the bolt while preventing the nut from rotating. During this tightening operation, do not allow the rotation of the part of the fastener assembly not turned by the wrench.

460-5.4.2 Preparation of Faying Surfaces: Provide coated and non-coated faying surfaces in accordance with the Contract Documents. Faying surfaces specified as blast-cleaned must satisfy SSPC SP-10 'Near-White Blast Cleaning.'

When painting of the slip-critical faying surface of bolted connections is required, use only the prime coat. Prepare and coat the faying surfaces prior to installation of the fasteners. Provide certification of the slip critical classification required in the Contract Documents.

Submit certification to the Engineer that galvanized faying surfaces meet or exceed a Class C slip critical classification, unless a different classification is required elsewhere in the Contract Documents. Mechanically roughen galvanized faying surfaces in accordance with the galvanizer's recommendations.

460-5.4.3 Reaming: Do not over size bolt holes by reaming (or any other method) without the approval of the Engineer.

460-5.4.4 Drifting: Do not over size, stretch or otherwise damage bolt holes by improper and excessive drifting.

460-5.4.5 Splice Plate Filler Material: Unless otherwise specified in the Contract Documents, provide filler material edges within 1/8 inch of the adjacent splice material edge. Where required for proper alignment at a bolted flange splice, additional filler material may be added provided that the total thickness of filler plates is less than 1/4 inch.

460-5.4.6 Installation of Fastener Assemblies: Unless shown otherwise in the Erection Plan, install the bolts of the connection by progressing systematically from the most rigid part of the connection to the free edges. Install bolts in all holes of the connection and bring them to a "snug tight" condition. Following the sequence indicated in the Erection Plan, further tighten all the bolts in the connection.

For ASTM A325 bolts, obtain the required bolt tension as shown in Table 460-6, Minimum Required Fastener Tension in accordance with the turn-of-nut method specified in 460-5.4.8, or when DTIs are used, the DTI tightening method specified in 460-5.4.9.

For connections (such as large main load-carrying members or truss joints) in which previously tightened high strength bolts become loose and require retightening upon the tensioning of others, install into a minimum of ten percent of the holes fully tensioned bolts prior to final tensioning of the permanent bolts. Distribute these first bolts randomly throughout the connection. If directed by the Engineer, remove the initial bolts and install permanent bolts at each location, otherwise retighten in accordance with 460-5.3.

Table 460-6
Minimum Required Fastener Tension

Bolt Size, inch	Tension ASTM A 325 bolts, kips
5/8	19
3/4	28
7/8	39
1	51
1 1/8	56
1 1/4	71
1 3/8	85
1 1/2	103

460-5.4.7 Bolt Tension: Provide a Skidmore-Wilhelm Calibrator, or other equivalent bolt tension measuring device, wherever final connections are being made. Confirm the accuracy of the tension measuring device by having it calibrated by an approved testing agency once a year.

460-5.4.8 Turn-of-Nut Tightening: For each work shift, perform tests utilizing a representative sample of five fastener assemblies, from each LOT to be installed that shift. Perform the tests using the tension measuring device, following the same procedure to be used for actual installation of the fastener assemblies, to a snug-tight tension and corresponding torque, which, when the additional turns required in Table 460-7, Nut Rotation from the Snug-Tight Condition are added, will result in at least 1.05 times the minimum required fastener installation tension as shown in Table 460-6. Place a washer under the part turned in the tightening of the bolt. Consider the job inspection snug-tight torque as the average of three test values determined after rejecting the high and low-test values.

For fastener assemblies too short to fit in the tension measuring device, modify the determination of the job inspection snug-tight torque in accordance with FM 5-582.

460-5.4.8.1 Snug-Tight Condition: In the turn-of-nut method, first bring all the fastener assemblies of the connection to a "snug-tight" condition to ensure that all parts of the connection are in firm contact with each other. For the purposes of this specification, "firm contact" shall mean the condition that exists on a faying surface when the plies are solidly seated against each other, but not necessarily in continuous contact. Regard snug-tight as the tightness required to produce the bolt tension, which following the final applied rotation, produces at least
1.05 times the minimum required bolt tension in accordance with Table 460-6, Minimum Required Fastener Tension. In the presence of the Engineer, and on a daily basis, determine the job inspection snug-tight torque as specified herein.

460-5.4.8.2 Final Tightening: After verification of the snug-tight condition in accordance with 460-5.4.11 by the Engineer, tighten all fastener assemblies in the joint by applying the applicable amount of nut rotation specified in Table 460-7, Nut Rotation from the Snug-Tight Condition. Once snug-tight, bring all fasteners to the required tension within the same work shift.

Table 460-7
Nut Rotation from the Snug-Tight Condition

Bolt Length Measured from Underside of Head to End of Bolt	Both Faces Normal to Bolt Axis	One Face Normal to Bolt Axis and Other Face Sloped Not More than 20:1.Bevel Washer not Used.	Both Faces Sloped Not More than 20:1 from Normal to Bolt Axis. Bevel Washers not Used.
Up to and Including Four (4) Diameters	1/3 turn	1/2 turn	2/3 turn
Over Four (4) Diameters but not Exceeding Eight (8) Diameters	1/2 turn	2/3 turn	5/6 turn
Over Eight (8) Diameters but Not Exceeding Twelve (12) Diameters	2/3 turn	5/6 turn	1 turn

Notes:
1. Nut rotation is relative to the bolt, regardless of the element being turned.
2. Tolerance for bolts installed by 1/2 turn or less is ± 30 degrees. For bolts installed by 2/3 turn or more, the tolerance is ± 45 degrees.
3. Nut rotations given are only applicable to connections in which all material within the grip of the bolt is steel.
4. For bolt lengths exceeding 12 diameters, establish the required rotation by performing actual tests in a suitable tension device simulating the actual conditions. Submit procedures to the Engineer for review.

460-5.4.9 Direct-Tension-Indicator (DTI) Tightening: After complying with the requirements of 460-5.2.2, install and tighten DTI devices following the procedures described in the DTI Verification Test. Do not permit the DTI to turn during installation and tightening. Provide washers in accordance with 460-5.4.10.

460-5.4.9.1 Snug-Tight Condition: Install the bolts as specified through Step 3 (Snug-Tight Condition) of the DTI Verification test. If the 0.005 inch feeler gage is refused in more gaps than shown in the table in Step 3.5 of the test, or the DTI device becomes loose and can be spun by hand, remove the bolt and DTI device, discarding the DTI device. Provide a new DTI device and reinstall the assembly and bring to the snug-tight condition.

460-5.4.9.2 Final Tightening: After verification by the Engineer that the snug-tight condition for all bolts has been met, tighten all fastener assemblies in the joint such that the number of spaces in which the 0.005 inch thickness gauge is refused is equal to or greater than the number shown in Table 460-8, DTI Device Tightening Criteria. Once snug-tight, bring all fasteners to the required tension within the same work shift.

Table 460-8
DTI Device Tightening Criteria

Number of Spaces in DTI	4	5	6	7	8	9
Minimum Spaces in which Gage is Refused	2	3	3	4	4	5

Do not tighten the assembly beyond the smallest gap permitted in Step 3.5 of FM 5-583. Remove and replace bolts, discarding the DTI, which have a DTI with a smaller gap or no gap.

460-5.4.10 Washers:

460-5.4.10.1 General: Provide ASTM F436 hardened steel washers as follows:

1. For connections (and all associated testing) using ASTM A490 bolts, use a hardened washer under each element.

2. For connections using ASTM A325 bolts, use hardened washers under the turned element. tests.

3. Use hardened steel washers as part of the Rotational Capacity

4. Where the outer face of the bolted parts has a slope of greater than 20:1 with respect to a plane normal to the bolt axis, use a hardened, beveled washer to compensate for the lack of parallelism.

5. Where bolts are to be installed in a oversized or slotted hole in an outer ply, provide a single washer satisfying ASTM F436, or continuous bar satisfying ASTM A709: for ASTM A325 bolts, provide a thickness of at least 5/16 inch; and for ASTM A490 bolts, provide a thickness of 3/8 inch. Provide these washers or bars to completely cover the slot after installation. Provide a finish consistent with the bolt specified.

6. In non-Direct-Tension-Indicator (DTI) applications, clip washers on one side to a point not closer than 7/8 of the bolt diameter from the center of the washer, if necessary.

460-5.4.10.2 Use of Washers with Direct-Tension-Indicators (DTIs) Devices: When DTIs are used; use ASTM F436 hardened washers as follows:

1. When the nut is turned and the DTI is located under the bolt head, a hardened washer is to be located under the nut.

2. When the nut is turned and the DTI is located under the nut, a hardened washer is to be located between the nut and the DTI.

3. When the bolt head is turned and the DTI is located under the nut, a hardened washer is to be located under the bolt head.

4. When the bolt head is turned and the DTI is located under the bolt head, a hardened washer is to be located between the bolt head and the DTI.

460-5.4.11 Inspection:

460-5.4.11.1 Turn-of-Nut Tightening:

1. Once the snug-tight condition is achieved for all of the fastener assemblies of the connection, within 24 hours of snugging the first bolt in the connection and in the presence of the Engineer, verify for a minimum of three (3) bolts [two (2) for two bolt connections] or 10% of the fastener assemblies, that the job inspection snug-tight torque has been attained. These fasteners are to have a snug-tight torque equal to or exceeding that specified in 460-5.4.8. Perform this check using the same torque wrench used in 460-5.4.8. For bolts tested in accordance with FM 5-583 or when multiple torque wrenches are required, provide a calibrated torque wrench or wrenches.

2. If the tested fasteners do not obtain the job inspection snug-tight torque, test all remaining untested fastener assemblies using the torque wrench in the connection in question. Following testing of all assemblies, bring to snug-tight all assemblies and retest as stated above. Re-snug and retest as necessary using the calibrated torque wrench until the minimum testing stated above is performed favorably.

3. Following confirmation of the snug-tight condition as performed by the Contractor, and in the presence of the Engineer, match mark the fastener assemblies on the end of the bolt thread and on the nut, and then tighten the nut the amount of rotation specified in Table 460-7, Nut Rotation from the Snug-Tight Condition. The Engineer will accept the connection as fully tightened when all of the following conditions are met:

a. the rotation specified in Table 460-7 has been achieved,

b. there are no loose assemblies in the connection,

c. all plies of the connection are in firm contact,

d. there are no indications that excessive stretching or yielding has occurred in the fastener assembly,

e. bolt stick-through is consistent per LOT.

460-5.4.11.2 Direct-Tension-Indicator (DTI) Tightening: Prior to bringing the connection to a snug-tight condition, verify in the presence of the Engineer that the 'dimples' of the DTI are not deformed or damaged. Bring the connection to a snug-tight condition and tighten in accordance with the requirements of 460-5.4.9. The Engineer will accept the connection as fully tightened when all of the following conditions are met:

1. The requirements of 460-5.4.9 have been achieved,

2. There are no loose assemblies in the connection,

3. All plies of the connection are in firm contact,

4. There are no indications that excessive stretching or yielding has occurred in the fastener assembly,

5. Bolt stick-through is consistent per LOT.

460-6 Welding.

460-6.1 General: Perform all shop and field welding in accordance with the applicable AWS Welding Code. This requirement includes the use of qualified welders, qualified weld procedures, and qualified inspection personnel.

460-6.2 Welding on Non-Dynamically Loaded Elements: Perform welding on miscellaneous components and other statically (non-dynamically, non-cyclically, etc.) loaded structural elements in accordance with the AWS D1.1, Structural Welding Code, or the AASHTO/AWS D1.5, Bridge Welding Code.

460-6.3 Electroslag Welding: Perform NGI-ESW welding in accordance with the

AASHTO/AWS D1.5, Bridge Welding Code.

460-6.4 Welding of Hollow Structural Steel Sections (Pipes and Tubes): Except as noted in the Contract Documents, perform all shop and field welding of Hollow Structural Shapes in accordance with the AWS D1.1, Structural Welding Code as amended herein.

460-6.4.1 Highway Sign Structures, Luminaires and Traffic Signals: For structural steel sign structures, lighting poles, and traffic signal poles, comply with AWS D1.1 Structural Welding Code. as well as the additional requirements of AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals, Section 5.15, Welded Connections.

460-6.4.2 Tubular Bridge or Sign Structures: Comply with the requirements of the AWS D1.1 Structural Welding Code as amended by the following:

Unless otherwise shown in the Plans, perform ultrasonic testing (UT) or radiographic testing (RT) on full penetration groove welds at the following frequency (use the AWS D1.1 Tubular Connections Class R Criteria for UT and Cyclically Loaded Criteria for RT. One hundred percent of each joint subject to tension or reversal of stress. Twenty-five percent of each joint subject to only compression or

One hundred percent of each joint subject to tension or reversal of shear. If discontinuities are found in the joint, the remainder of the joint shall be tested.

Perform Magnetic Particle Testing at the following frequencies:

A minimum of 25% of all fillet or partial penetration groove welds in main members (Use the AWS D1.1 Tubular Connections Criteria). If discontinuities are found, the remainder of the welds on the members shall be tested.

460-6.5 Field Welding: Field weld only with the approval of the Engineer.

460-6.6 Tack Welds: Do not weld or tack any fill plates, brackets, clips, shipping devices, or other materials not required by the Contract Documents or allowed by the AASHTO/AWS D1.5 Bridge Welding Code.

460-7 Erection.

460-7.1 Pre-erection Requirements:

460-7.1.1 Erection Quality Control (QC) Plan: Submit an Erection QC Plan for review and approval of the Engineer.

460-7.1.2 Submittals: Meet the requirements of Sections 5 and 103 for any required submittals. Provide submittals to the Engineer for review by the City in accordance with Section 5 and the Contract Documents.

460-7.1.3 Erection Plan: Submit, for the Engineer's review, an Erection Plan locating all primary members, lifting equipment and temporary supports or braces, and bolting pattern tightening procedures not considered routine. Ensure that the plan includes the Specialty Engineer's signature and stamp. Include supporting calculations indicating that the design unit stresses indicated in the Contract Documents have not been exceeded. Submit this plan or plans to the Engineer three weeks before erecting the piece or pieces.

Include the following information in the Erection Plan:

1. A plan of the work area showing all substructure units and foundations; surface roads and railroads; all streams, creeks and rivers; all overhead utilities; and any underground utilities that could possibly impact, or be adversely affected by, erection operations as determined by the Specialty Engineer.

2. The erection sequence for all primary load-carrying members and all primary load-carrying member bracing. Note any and all permanent or temporary support and/or bracing locations, including crane-holding positions.

3. The center of gravity locations, pick weight and delivery orientation for all primary load-carrying members.

4. Identify any bolting requirements not considered routine.

5. Locate all pick crane work points.

6. Identify all temporary works and staging areas such as barges, mats and temporary excavation support.

7. Include capacity charts on the drawings for each crane configuration and boom extension utilized.

8. Details of all temporary bracing, falsework, towers and shoring.

9. Submit any procedures requested by the Engineer and not contained in the Erection Plan.

460-7.2 Special Requirements for Uncoated Weathering Steel:

460-7.2.1 General: Do not use marking materials (grease sticks, crayons) that leave behind a residual film that may affect the weathering process of the steel. Store the girders as required for non-weathering steels.

460-7.2.2 Steel Preparations: Prior to erection, perform the following as appropriate:

Blast clean the exposed fascia of the exterior girders (both I and box) to meet SSPC-SP10 criteria; blast clean the remaining exposed surfaces of steel trapezoidal girders, not required to be prepared otherwise, to meet SSPC-SP6 criteria; for steel I-girders, if a non- uniform mill scale finish has developed, as determined by the Engineer, blast clean all remaining exposed surfaces, not required to be prepared otherwise, to SSPC-SP6 criteria; coat the inside of box members including, but not limited to, all bracing members, cross frames and diaphragms in accordance with Section 560. Coat the exterior face of box girder end diaphragms and all interior surfaces of box girders extending beyond the end diaphragm with an inorganic zinc coating system in accordance with Section 560.

460-7.2.3 Concrete Substructure Preparations:

460-7.2.3.1 Substructure Areas Not Receiving Class 5 Finish: Prior to erection of the girders, cover all exposed substructure concrete surfaces to protect them against staining from the weathering steel components. Leave the covering in place until after placement of the concrete deck. As directed by the Engineer, clean all visible stains on concrete in areas not receiving a Class 5 Finish by sandblasting and follow-on cleaning using a stain remover or commercial cleaner after completion of the structure in accordance with Section 400.

460-7.2.3.2 Substructure Areas Receiving a Class 5 Finish: If the Class 5 Finish is to be applied prior to the placement of the concrete deck, cover all finish concrete surfaces after application and curing of the Class 5 Finish to protect them from staining from the weathering steel components. Leave the covering in place until after placement of the concrete deck. Upon removal of the covering, reapply the Class 5 Finish to cover any stains which may be present.

If the Class 5 Finish is to be applied after placement of the concrete deck, no substructure covering will be required.

460-7.2.4 Structure and Site Clean Up: Upon the completion of construction, remove all oil, dirt, grease or other foreign material, including excessive or uneven mill scale from the steel. Remove lubricants from the exposed surfaces of installed fastener assemblies and other surfaces in accordance with the manufacturer's recommendations. Follow procedures specified in Section 560 as appropriate. Final surface finish is to be an even mill scale as approved by the Engineer.

460-7.3 Coordination with Substructure: Prior to the erection of primary load-carrying members, conduct a survey to document the vertical, longitudinal and transverse position of all substructure units and anchor rod locations. Appropriately account for ambient temperature in the survey.

Should a discrepancy be identified with the Contract Documents, submit the necessary details to the Engineer for resolution.

460-7.4 Placing Anchor Rods: Locate and place anchor rods within the tolerance shown in the Contract Documents or within 1/4 inch of the theoretical location shown. If anchor rods cannot be located to the specified tolerance, place only with the approval of the Engineer. Unless shown otherwise in the Contract Documents, provide galvanized anchor rods, nuts and washers as follows:

1. Set the anchor rods in preformed holes vertical to the plane of the bridge seat.
2. Provide 4 inch diameter holes.
3. Provide non-shrink grout/mortar of a strength greater than or equal to that of the substructure concrete strength, or as shown elsewhere in the Contract Documents.
4. Install the rods in accordance with the grout/mortar manufacturer's recommendations.
5. Clean the threads of the anchor rods as necessary without damaging the coating.

460-7.5 Preparation of Bearing Areas and Setting of Bearings: Prior to placing superstructure bearing units (including but not limited to neoprene pads and masonry plates), prepare the top of concrete pad (bearing area) in accordance with Section 400. If a discrepancy is identified, report it to the Engineer for resolution.

For expansion bearings with slotted holes for anchor rods, which allow movement of the superstructure with respect to the substructure, vary the location of the slotted plate in relation to the anchor rods, in accordance with the prevailing temperature at the time of setting.

For fixed bearings at multiple adjacent piers, if necessary, horizontally jack the substructure units to correctly set the centerline of bearing. Adequately account for temperature.

Unless specified elsewhere in the Contract Documents, locate the theoretical centerline of bearings to within 1/16 inch transverse to longitudinal girder lines; and in the direction parallel to the longitudinal girder line locate the theoretical centerline of bearing within
1/4 inch of the theoretical centerline of bearing.

After setting the bearings and installing anchor rod nuts, washers and any other associated hardware specified in the Contract Documents, clean the protruding/exposed surfaces of the assembly of all deleterious material. Finish-coat metal parts in accordance with 460-
4.3.4.11.

460-7.6 Tightening of Anchor Bolt/Rod Nuts:

460-7.6.1 Fixed and Expansion Pot Bearing: Tighten anchor bolts or rod nuts to a 'snug tight' condition such that the different mating surfaces (such as the top of concrete, neoprene and steel) are in firm contact. The nut or bolt is to be tight enough to develop friction between surfaces to prevent sliding, but not over-tightened that bulging or damage occurs in any of the mating materials.

460-7.6.2 Fixed and Expansion Bearings with Elastomeric Bearing Pads: Draw down the lower nut such that a total gap of 1/2 inch exists between the nut and bearing plate.

Tighten a second nut of the same specification to a snug tight condition against the lower nut maintaining the required gap.

460-7.7 Bolted Connections: For splice connections of primary members, as well as connections of diaphragms or crossframes, fill at least 50% of the holes prior to crane release. The 50% may be either erection bolts in a snug tight condition or full size erection pins, but at least half (25% of all holes) shall be bolts, and sufficient pins shall be used near outside corners of splice plates and at member ends near splice plate edges to ensure alignment. Filled holes should be uniformly distributed between the web and flange connections for primary members such that approximately 50% of the web connections are filled and approximately 50% of the flange connections are filled. For diaphragms or cross-frames, the filled holes should be uniformly distributed between all the bolt groups connecting the diaphragm or crossframe to the primary member. The 50% requirement may be waived if a reduced percentage is calculated as sufficient and shown on the approved Erection Plan. Primary member splice connections that are made up on the ground (prior to erection) shall be 100 percent complete prior to any lifting operation. Fully tighten all bolts prior to installation of deck forming for each unit.

460-7.8 Final Position of Girder Webs: Unless shown elsewhere in the Contract Documents, detail the girders and cross frames as directed by the Engineer. The final condition is to be defined as with the deck and parapets cast, but without any future wearing surface. A web will be considered plumb if it is within a tolerance horizontally between the top and bottom of the web of 3/32 inch per foot of web depth compared against the theoretical position as required in the Contract Documents. Measure the out-of-plumb perpendicular to the face of the web. Erect trapezoidal girders to the geometry shown in the Contract Documents to the same 3/32 inch per foot of web depth tolerance.

460-7.9 Inspection and Final Acceptance:

460-7.9.1 General: Perform Quality Control inspections of all phases of the work. The inspection frequency and depth shall be sufficient to ensure that all materials and workmanship incorporated into the work meet the requirements of the Contract Documents and that the processes are controlled to ensure that the final finished product(s) conform to the physical characteristics and dimensions required by the Contract Documents. The Quality Control Manager shall be responsible for all inspection operations. An adequate number of Quality Control Inspectors shall be available to ensure review of all materials and fabrication processes are preformed in accordance with the Producer QC Plan. Weekly meetings shall be held with the Engineer to review inspection findings. The review of this information is to identify any refinements and/or improvements in the process being utilized in the work. The frequency of the meetings may be altered by the Engineer.

460-7.9.2 Inspection/Final Acceptance: Ensure the final alignment, profile and fastening of the erected steel is in accordance with the Contract Documents.

460-8 Method of Measurement.

460-8.1 General: The quantities to be paid for will be the items covered by this Section, following acceptance by the Engineer. Partial payments may be made for fabricated components yet to be assembled into larger components, members and assemblies as allowed for elsewhere in the Contract Documents.

460-8.2 Deductions and Allowances: No deductions from the computed weight of rolled or fabricated structural steel or miscellaneous components will be made for sheared edges, punchings, holes, milling, plaining or other items of waste associated with the finished components or parts.

460-8.3 Weights of Structural Steel and Miscellaneous Materials: The weights of structural steel will be taken as nominal weights as reported in the AASHTO LRFD Bridge Construction Specifications and ASTM Specifications, in that order of precedence, using the dimensions shown in the Contract Documents.

460-8.4 Structural Steel: The quantity of structural steel and miscellaneous metals becoming part of the completed structure and accepted by the Engineer will be paid for at the quantity shown in the Contract Documents, or as modified by the Engineer, measured in pounds, or by the Contract lump sum price for Structural Steel.

460-8.5 High-Strength Fastener Assemblies: The weight of high-strength fastener assemblies (including nuts and washers) installed by the Contractor and accepted by the Engineer will be computed on the basis of an average length in accordance with Table 460-9:

Table 460-9
Weights of High-Strength Fastener Assemblies

Diameter of High-Strength Fasteners, inch	3/4 inch	7/8 inch	1 inch	1 1/8 inch	1 1/4 inch
Weight per 100, pounds	52	100	135	182	238

The weight of high-strength fastener assemblies will be included in the determination of the weight of the completed structure in determining the quantity paid when payment is not by Lump Sum. The Engineer will determine values for sizes of high-strength fastener assemblies not shown.

460-8.6 Welding and Welds; Fasteners Not Designated as High-Strength; Anchor Rods, Nuts, Bolts and Associated Washers; Transporting; Handling; and Erection: Welding and welds; fastener assemblies not designated as high-strength; anchor rods, nuts, bolts and associated washers; transporting; handling; and erection are considered incidental to the work and will not be paid for separately.

460-8.7 Shims and Fill Plates: The quantity of shims and fill plates will be included in the determination of the weight of the completed structure in determining the quantity paid when payment is not by Lump Sum.

460-8.8 Coatings: The preparation, application, clean-up and the consumables used in the coatings process are considered incidental to the work and will not be paid for separately.

460-8.9 Weathering Steel Preparation, Handling and/or Clean-up: The preparation, handling, and/or clean-up of weathering steel or the “rust" marks on other items (concrete units, etc.) caused by the development of the patina are considered incidental to the work and will not be paid for separately.

460-8.10 Shear Connectors: Shear connectors are considered incidental to the work and will not be paid for separately.

460-8.11 Span Jacking (Fixed Bridge): Jacking of substructure units of adjacent fixed piers required to set bearing in accordance with the Contract Documents is considered incidental to the work and will not be paid for separately.

460-9 Basis of Payment.

460-9.1 General: Prices and payments will be for full compensation for all work specified in this Section completed and accepted, including but not limited to testing, bolting, welding,

cleaning and coating, temporary works and erection. No separate payment will be made for falsework or other erection expense.

460-9.2 Payment Items: Payment will be made under:

Item No. 460- 1-	Structural Steel - Rehab - per pound.
Item No. 460- 2-	Structural Steel - New/Widening - lump sum.
Item No. 460- 6-	Ladders & Platforms - lump sum.
Item No. 460- 13-	Structural Steel Rehab - Sandwich Plate System - per square yard.
Item No. 515- 4-	Aluminum Bullet Railings - per linear foot.
Item No. 460- 71-	Metal Traffic Railing - per foot.
Item No. 460- 81-	Rivet or High-Strength Bolt Replacement - each.
Item No. 460- 95-	Structural Steel Repair - per pound.
Item No. 460- 98-	Pipe Hanger - each.
Item No. 460-112-	Anchor Bolt Replacement - each.

SECTION 521 - CONCRETE BARRIERS, TRAFFIC RAILING BARRIERS AND PARAPETS

521-1 Description.

Construct precast or cast in place concrete barriers, traffic railing barriers and parapets, herein referred to as barrier wall, in accordance with the Design Standards and details shown in the Plans. Use stationary removable forms or sliding forms to construct the barrier wall. Do not use permanent precast concrete barrier wall on bridge or box culvert structures.

Submit written certification from the manufacturer of the precast barrier wall that the barrier wall meets the requirements of this Section. Barrier wall is produced using certification acceptance; therefore, assume responsibility for performance of all quality control testing and inspections required by Sections 346 and 400 for barrier wall construction. Perform all Quality Control Testing and inspections using CTQP qualified testing personnel. Perform compressive strength testing in a laboratory inspected by CCRL or CMEC.

Ensure that each shipment of products to the job site includes a list of products shipped and the required written certification statement for each product. Submit this list and certifications to the Engineer.

521-2 Materials.

Meet the following requirements:

Portland Cement Concrete .....Section 346
Reinforcing Steel .....Section 415
Joint Materials..... 932-1.1
Joint Materials*..... 932-1.2 and 932-1.3
Barrier Delineators *(1) ..... Sections 705 and 993
*Use products listed on the City's Approved Product List (APL).
(1) Mount delineators on the barriers by adhesive or mechanical means as per the manufacturer's recommendations and in accordance with the details shown in the Plans and the Design Standards.

521-3 Precast Temporary Barrier Wall.

Meet the requirements of 102-9.5.2.

521-4 Construction.

521-4.1 General: The Contractor may use stationary removable forms or slip form construction methods provided a completed barrier wall with acceptable alignment and finish is obtained. Do not use forms which are damaged or are not in alignment. At no expense to the City, remove and replace sections of barrier wall having unconsolidated concrete, surface blemishes, deviations in alignment or profile which exceed tolerances, or other defects which cannot be repaired to the satisfaction of the Engineer.

521-4.2 Stationary Form Construction: Provide precast or cast in place concrete barrier wall constructed using stationary forms in accordance with Section 400 and provide a general surface finish. Align and erect the stationary form so that all plane surfaces of the finished wall will have no deviation greater than 3/8 inch measured as an ordinate between the concrete and a
10 foot straightedge. Correct all alignment deviations greater than 3/8 inch. Straightedge by half lapping the straightedge for the full length of all plane surfaces.

521-4.3 Slip Form Construction: When electing to use the slip form method in lieu of the stationary forming method, place the concrete with a slip form machine approved by the

Engineer. The concrete cover tolerance is plus or minus 1-1/4 inches from the plan dimensions, except the minimum concrete cover, as constructed, must not be less than 1-3/4 inches.

Provide a finished texture to the slip formed barrier wall by hand troweling, brushing, or both to eliminate pockmarks, blemishes and any other discontinuities in surface texture. Ensure that the final finish has a fine texture and is free of pinholes, pockmarks, and blemishes.

Remove and recast or repair sections of slip formed barrier wall having areas of unconsolidated concrete, having surface blemishes, and/or having pockmarks greater than 1/2 inch in diameter after hand troweling and brushing. Repair areas of unsatisfactory surface finish by hand methods using mortar screened from the concrete used to construct the barrier wall. Use the mortar screened from the barrier wall concrete only to fill holes and surface blemishes below the slip formed surface of the concrete. Do not use mortar as a surface overlay coating on the barrier wall concrete.

During the finishing operation, while the concrete remains plastic, straightedge all plane surfaces of the slip formed barrier wall with a 10 foot straightedge. Straightedge by half lapping the straightedge for the full length of the plane surfaces. Correct any deviation found during straightedging, greater than 3/8 inch, measured as an ordinate between the concrete
surface and the straightedge, in an approved manner at no expense to the City. Do not use surface overlay coatings of mortar screened from the concrete, or surface overlay coatings of concrete to correct alignment deviations.

521-5 Curing.

Meet the requirements of Section 400.

521-6 Joints.

521-6.1 General: Place expansion and contraction joints in concrete barrier wall either mounted on or adjoining rigid structures in a manner similar to the type and method of jointing
used in the supporting or adjoining structure or as shown in the Contract Documents. Place expansion and contraction joints in concrete barrier wall supported by soil or flexible foundation materials in the manner detailed in the Plans.

521-6.2 Contraction Joints in Barrier Wall Supported by or Adjoining Rigid Structures: The Contractor may form or saw contraction joints. When sawing contraction joints, saw them as soon as the concrete has hardened sufficiently to permit sawing without raveling
and before uncontrolled cracking occurs, but in no case later than 12 hours after casting. Match contraction joints to adjacent contraction joints in the structure. Space contraction joints at 15 to
30 foot intervals. For barrier wall on bridge structures or approach slabs, space contraction joints as shown in the Contract Documents.

521-6.3 Expansion Joints in Barrier Wall Supported by or Adjoining Rigid Structures: Construct expansion joints at right angles to the face, and extend them through the entire cross-section of the barrier wall. Construct barrier wall expansion joints at the same location and width as the expansion joints in the structure on which the wall rests and at other locations shown in the Contract Documents. When constructing reinforced barrier wall, form expansion joints with an expansion filler material or removable forming materials and secure to the forms as required to provide proper position. When using slip forming to construct non-reinforced barrier wall, construct expansion joints as in reinforced barrier wall or saw the joint

through the plastic concrete the full depth and width of the barrier section. Where using the plastic sawing method, place close fitting shields over the concrete on each side of the joint for protection during sawing and hand finishing of the concrete at the joint.

521-7 Repairs and Rejection.

For permanent precast concrete barrier wall that has not been installed, evaluate cracks, spalls and other deficiencies in accordance with 450-12. Repair deficiencies in accordance with
450-13 or the plant's approved repair methods that are included as part of the Quality Control (QC) Plan. Ensure that the original performance and durability of the repaired barrier wall is maintained. Use materials for concrete repair that will meet or exceed the strength requirement for the class of concrete used. Materials meeting the requirements of Section 930 may be substituted for non-shrink grout when required by 450-13. Concrete barrier wall is subject to rejection if it fails to conform to any of the Specification requirements after repair. The disposition of concrete cracks in barrier wall after installation shall be in accordance with 400-
21. Cracks in unreinforced, plain concrete barrier walls as detailed in Design Standards, Index No. 410 do not require repair unless directed by the Engineer.

521-8 Method of Measurement.

The quantity to be paid for under this Section will be the plan quantity, in feet, completed and accepted. The quantity will be measured along the top of the barrier wall from the begin to end station, including transitional and end sections, with no deduction for expansion joints or open joints. Barrier wall on bridge structures and approach slabs to be removed shall be included in the cost of removal of existing structures. Barrier wall to be removed along roadways to be paid for as concrete barrier wall removal.

521-9 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including all reinforcing steel, conduits, materials and incidentals necessary to complete the work.

Payment will be made under:

Item No. 521- 1-	Median Concrete Barrier Wall - per foot.
Item No. 521- 5-	Concrete Traffic Railing Barrier - Bridge - per foot.
Item No. 521- 6-	Concrete Parapet - per foot.
Item No. 521- 7-	Concrete Traffic Railing Barrier - Retaining Wall System - per foot.
Item No. 521- 8-	Concrete Traffic Railing – with Junction Slab - per foot.
Item No. 521- 72-	Shoulder Concrete Barrier Wall - per foot.
Item No. 521- 73-	Concrete Barrier Wall Removal - per foot.

ROADWAY

SECTION 104 - PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION

104-1 Description.

Provide erosion control measures on the project and in areas outside the right-of-way where work is accomplished in conjunction with the project, so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project right-of-way and damage to work on the project. Construct and maintain temporary erosion control features or, where practical, construct and maintain permanent erosion control features as shown in the Plans or as may be directed by the Engineer.

104-2 General.

Coordinate the installation of temporary erosion control features with the construction of the permanent erosion control features to the extent necessary to ensure economical, effective, and continuous control of erosion and water pollution throughout the life of the Contract.

Due to unanticipated conditions, the Engineer may direct the use of control features or methods other than those included in the original Contract. In such event, the City will pay for this additional work as unforeseeable work.

104-3 Control of Contractor's Operations Which May Result in Water Pollution.

Prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments with fuels, oils, bitumens, calcium chloride, or other harmful materials. Also, conduct and schedule operations to avoid or otherwise minimize pollution or siltation of such water impoundments, and to avoid interference with movement of migratory fish. Do not dump any residue from dust collectors or washers into any live stream.

Restrict construction operations in rivers, streams, lakes, tidal waters, reservoirs, canals, and other water impoundments to those areas where it is necessary to perform filling or excavation to accomplish the work shown in the Plans and to those areas which must be entered to construct temporary or permanent structures. As soon as conditions permit, promptly clear rivers, streams, and impoundments of all obstructions placed therein or caused by construction operations.

Do not frequently ford live streams with construction equipment. Wherever an appreciable number of stream crossings are necessary at any one location, use a temporary bridge or other structure.

Except as necessary for construction, do not deposit excavated material in rivers, streams, canals, or impoundments, or in a position close enough thereto, to be washed away by high water or runoff.

Where pumps are used to remove highly turbid waters from enclosed construction areas such as cofferdams or forms, treat the water by one or more of the following methods prior to discharge into State waters: pumping into grassed swales or appropriate vegetated areas or sediment basins, or confined by an appropriate enclosure such as turbidity barriers when other methods are not considered appropriate.

Do not disturb lands or waters outside the limits of construction as staked, except as authorized by the Engineer.

Obtain the Engineer's approval for the location of, and method of operation in, borrow pits, material pits, and disposal areas furnished for waste material from the project (other than commercially operated sources) such that erosion during and after completion of the work will not result in probability of detrimental siltation or water pollution.

104-4 Materials for Temporary Erosion Control.

The Engineer will not require testing of materials used in construction of temporary erosion control features other than as provided for geotextile fabric in 985-3 unless such material is to be incorporated into the completed project. When no testing is required, the Engineer will base acceptance on visual inspection.

The Contractor may use new or used materials for the construction of temporary silt fence, staked turbidity barriers, and floating turbidity barrier not to be incorporated into the completed project, subject to the approval of the Engineer.

104-5 Preconstruction Requirements.

Prior to the Preconstruction Conference, submit to the City an Erosion Control Plan meeting the requirements or special conditions of all permits authorizing project construction. If no permits are required or the approved permits do not contain special conditions or specifically address erosion and water pollution, the project Erosion Control Plan will be governed by 7-1.1, 7-2.2, 7-8.1, 7-8.2, and Section 104.

When a DEP generic permit is issued, the Contractor's Erosion Control Plan shall be prepared to accompany the City's Stormwater Pollution Prevention Plan (SWPPP). Ensure the Erosion Control Plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Do not begin any soil disturbing activities until City approval of the Contractor's Erosion Control Plan, including required signed certification statements have been submitted to the City.

Failure to sign and submit any required documents or certification statements will be considered a default of the Contract. Any soil disturbing activities performed without the required signed documents or certification statements may be considered a violation of the DEP Generic Permit.

When the SWPPP is required, prepare the Erosion Control Plan in accordance with the planned sequence of operations and present in a format acceptable to the City. The Erosion Control Plan shall describe, but not be limited to, the following items or activities:

1. For each phase of construction operations or activities, supply the following information:

a. Locations of all erosion control devices b. Types of all erosion control devices

c. Estimated time erosion control devices will be in operation

d. Monitoring schedules for maintenance of erosion control devices e. Methods of maintaining erosion control devices

f. Containment or removal methods for pollutants or hazardous wastes

2. The name and telephone number of the person responsible for monitoring and maintaining the erosion control devices.

3. Submit for approval the Erosion Control Plans meeting paragraphs 3a, 3b, or 3c below:

a. Projects permitted by the Southwest Florida Water Management District

(SWFWMD), require the following:

Submit the Erosion Control Plan to the Engineer for review and to the appropriate SWFWMD Office for review and approval. Include the SWFWMD permit number on all submitted data or correspondence.

The Contractor may schedule a meeting with the appropriate SWFWMD Office to discuss his Erosion Control Plan in detail, to expedite the review and approval process. Advise the Engineer of the time and place of any meetings scheduled with SWFWMD.

Do not begin construction activities until the Erosion Control Plan receives written approval from both SWFWMD and the Engineer.

b. Projects permitted by the South Florida Water Management District or the St. Johns River Water Management District, require the following:

Obtain the Engineer's approval of the Erosion Control Plan.

Do not begin construction activities until the Erosion Control Plan receives written approval from the Engineer.

c. Projects authorized by permitting agencies other than the Water Management Districts or projects for which no permits are required require the following:

The Engineer will review and approve the Contractor's Erosion Control Plan.

Do not begin construction activities until the Erosion Control Plan receives written approval from the Engineer.

Comply with the approved Erosion Control Plan.

104-6 Construction Requirements.

104-6.1 Limitation of Exposure of Erodible Earth: The Engineer may limit the surface areas of unprotected erodible earth exposed by the construction operation and may direct the Contractor to provide erosion or pollution control measures to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal, or other water impoundments or to prevent detrimental effects on property outside the project right-of-way or damage to the project. Limit the area in which excavation and filling operations are being performed so that it does not exceed the capacity to keep the finish grading, turf, sod, and other such permanent erosion control measures current in accordance with the accepted schedule.

Do not allow the surface area of erodible earth that clearing and grubbing operations or excavation and filling operations expose to exceed 750,000 square feet without specific prior approval by the Engineer. This limitation applies separately to clearing and grubbing operations and excavation and filling operations.

The Engineer may increase or decrease the amount of surface area the Contractor may expose at any one time.

104-6.2 Incorporation of Erosion and Sediment Control Features: Incorporate permanent erosion control features into the project at the earliest practical time. Use temporary erosion and sediment control features found in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual) to correct conditions that develop during construction which were not foreseen at the time of design, to control erosion and sediment

prior to the time it is practical to construct permanent control features, or to provide immediate temporary control of erosion and sediment that develops during normal construction operations,

which are not associated with permanent erosion control features on the project. An electronic version of the E&SC Manual can be found at the following URL:

http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/Files/FLErosi onSedimentManual.pdf

Install all sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, gulf or ocean waters, or any wetlands associated therewith and to any adjacent property outside the right-of-way as required.

Complete the installation of sediment control devices prior to the commencement of any earthwork.

After installation of sediment control devices, repair portions of any devices damaged at no expense to the City. The Engineer may authorize temporary erosion and sediment control features when finished soil layer is specified in the Contract and the limited availability of that material from the grading operations will prevent scheduled progress of the work or damage the permanent erosion control features.

104-6.3 Scheduling of Successive Operations: Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter. Schedule and perform grading operations so that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

104-6.4 Details for Temporary Erosion and Sediment Control Features:

104-6.4.1 General: Use temporary erosion, sediment and water pollution control features found in the E&SC Manual. These features consist of, but are not limited to, temporary turf, rolled erosion control products, sediment containment systems, runoff control structures, sediment barriers, inlet protection systems, silt fences, turbidity barriers, and chemical treatment. For design details for some of these items, refer to the Design Standards and E&SC Manual.

104-6.4.2 Temporary Turf: The Engineer may designate certain areas of turf or sod constructed in accordance with Section 570 as temporary erosion control features. For areas not defined as sod, constructing temporary turf by seeding only is not an option for temporary erosion control under this Section. The Engineer may waive the turf establishment requirements of Section 570 for areas with temporary turf that will not be a part of the permanent construction.

104-6.4.3 Runoff Control Structures: Construct runoff control structures in accordance with the details shown in the Plans, the E&SC Manual, or as may be approved as suitable to adequately perform the intended function.

104-6.4.4 Sediment Containment Systems: Construct sediment containment systems in accordance with the details shown in the Plans, the E&SC Manual, or as may be approved as suitable to adequately perform the intended function. Clean out sediment containment systems as necessary in accordance with the Plans or as directed.

104-6.4.5 Sediment Barriers: Provide and install sediment barriers according to details shown in the Plans, as directed by the Engineer, or as shown in the E&SC Manual to protect against downstream accumulation of sediment. Sediment Barriers include, but are not limited to synthetic bales, silt fence, fiber logs and geosynthetic barriers. Reusable barriers that have had sediment deposits removed may be reinstalled on the project as approved by the Engineer.

104-6.4.6 Silt Fence:

104-6.4.6.1 General: Furnish, install, maintain, and remove silt fences, in accordance with the manufacturer's directions, these Specifications, the details as shown in the Plans, the Design Standards, and the E&SC Manual.

104-6.4.6.2 Materials and Installation: Use a geotextile fabric made from woven or nonwoven fabric, meeting the physical requirements of Section 985 according to those applications for erosion control.

Choose the type and size of posts, wire mesh reinforcement (if required), and method of installation. Do not use products which have a separate layer of plastic mesh or netting. Provide a durable and effective silt fence that controls sediment comparable to the Design Standards and the E&SC Manual.

Erect silt fence at upland locations, across ditchlines and at temporary locations shown in the Plans or approved by the Engineer where continuous construction activities change the natural contour and drainage runoff. Do not attach silt fence to existing trees unless approved by the Engineer.

104-6.4.6.3 Inspection and Maintenance: Inspect all silt fences immediately after each rainfall and at least daily during prolonged rainfall. Immediately correct any deficiencies. In addition, make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences as directed by the Engineer.

Remove sediment deposits when the deposit reaches approximately 1/2 of the volume capacity of the silt fence or as directed by the Engineer. Dress any sediment deposits remaining in place after the silt fence is no longer required to conform with the finished grade, and prepare and seed them in accordance with Section 570.

104-6.4.7 Floating Turbidity Barriers and Staked Turbidity Barriers: Install, maintain, and remove turbidity barriers to contain turbidity that may occur as the result of dredging, filling, or other construction activities which may cause turbidity to occur in the waters of the State. The Contractor may need to deploy turbidity barriers around isolated areas of concern such as seagrass beds, coral communities, etc. both within as well as outside the right-of-way limits. The Engineer will identify such areas. Place the barriers prior to the commencement of any work that could impact the area of concern. Install the barriers in accordance with the details shown in the Plans or as approved by the Engineer. Ensure that the type barrier used and the deployment and maintenance of the barrier will minimize dispersion of turbid waters from the construction site. The Engineer may approve alternate methods or materials.

Operate turbidity barriers in such a manner to avoid or minimize the degradation of the water quality of the surrounding waters and minimize damage to areas where floating barriers installed.

104-6.4.8 Inlet Protection System: Furnish and install inlet protection systems as shown in the Plans, Design Standards and the E&SC Manual.

104-6.4.9 Rolled Erosion Control Products (RECPs):

104-6.4.9.1 General: Install RECPs in locations where temporary protection from erosion is needed. Two situations occur that require artificial coverings. The two situations have differing material requirements, which are described below.

1. Use RECPs composed of natural or synthetic fiber mats, plastic sheeting, or netting as protection against erosion, when directed by the Engineer, during temporary pauses in construction caused by inclement weather or other circumstances. Remove the material when construction resumes.

2. Use RECPs as erosion control blankets, at locations shown in the Plans, to facilitate plant growth while permanent grassing is being established. For the purpose described, use non-toxic, biodegradable, natural or synthetic woven fiber mats. Install erosion control blankets capable of sustaining a maximum design velocity of 6.5 ft/sec as determined from tests performed by Utah State University, Texas Transportation Institute or an independent testing laboratory approved by the City. Submit to the Engineer, certified test reports from the manufacturer showing that the erosion control blankets meet the requirements of this Specification. Certification must be attested, by a person having legal authority to bind the manufacturing company. Also, furnish two 4 by 8 inch samples for product identification. The manufacturers test records shall be made available to the City upon request. Leave the material in place, as installed, to biodegrade.

104-6.4.10 Chemical Treatment: Provide chemical treatment in accordance with the E&SC Manual. Chemical treatment may be used to clarify turbid or sediment laden water that does not yet meet state water quality standards or as an amendment to other erosion prevention and sediment control products to aid in their performance. The contractor must provide all of the required toxicity testing information in accordance with the E&SC Manual to the Engineer for review and acceptance prior to using any chemical treatment on the project site.

104-6.5 Removal of Temporary Erosion Control Features: In general, remove or incorporate into the soil any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project in such a manner that no detrimental effect will result. The Engineer may direct that temporary features be left in place.

104-7 Maintenance of Erosion and Sediment Control Features.

104-7.1 General: Provide routine maintenance of permanent and temporary erosion and sediment control features, at no expense to the City, until the project is complete and accepted. If reconstruction of such erosion and sediment control features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary erosion and sediment control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features at no expense to the City. If reconstruction of permanent or temporary erosion and sediment control features is necessary due to factors beyond the control of the Contractor, the City will pay for replacement under the appropriate Contract pay item or items.

Inspect all erosion and sediment control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches or greater. Maintain all erosion control features as required in the Stormwater Pollution Prevention Plan, Contractor's Erosion Control Plan and as specified in the State of Florida City of Environmental Protection Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

104-8 Protection During Suspension of Contract Time.

If it is necessary to suspend the construction operations for any appreciable length of time, shape the top of the earthwork in such a manner to permit runoff of rainwater, and construct earth berms along the top edges of embankments to intercept runoff water. Provide

temporary slope drains to carry runoff from cuts and embankments that are in the vicinity of rivers, streams, canals, lakes, and impoundments. Locate slope drains at intervals of approximately 500 feet, and stabilize them by paving or by covering with waterproof materials. Should such preventive measures fail, immediately take such other action as necessary to effectively prevent erosion and siltation. The Engineer may direct the Contractor to perform, during such suspensions of operations, any other erosion and sediment control work deemed necessary.

104-9 Method of Measurement.

When separate items for temporary erosion control features are included in the Contract, the quantities to be paid for will be:

1. the area, in square yards, of rolled erosion control products;
2. the length, in feet, of runoff control structures, measured along the surface of the work constructed;
3. the number of sediment containment systems constructed and accepted;
4. the number of sediment containment system cleanouts accomplished and accepted
5. the length, in feet, of sediment barriers;
6. the length, in feet, of floating turbidity barrier;
7. the length, in feet, of staked turbidity barrier;
8. the number of inlet protection systems;
9. the area, in square yards, of chemical treatment.
10. the number of floc logs or drums of product for chemical treatment.

Upon acceptance by the Engineer, the quantity of floating turbidity barriers, sediment barriers, staked turbidity barriers, and inlet protection devices will be paid for regardless of whether materials are new, used, or relocated from a previous installation on the project.

104-10 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including construction and routine maintenance of temporary erosion control features.

Any additional costs resulting from compliance with the requirements of this Section, other than construction, routine maintenance, and removal of temporary erosion control features, will be included in the Contract unit prices for the item or items to which such costs are related. The work of performance turf designated as a temporary erosion control feature in accordance with 104-6.4.2 will be paid for under the appropriate pay items specified in the Contract Documents.

Separate payment will not be made for the cost of constructing temporary earth berms along the edges of the roadways to prevent erosion during grading and subsequent operations. The Contractor shall include these costs in the Contract prices for grading items.

Additional temporary erosion control features constructed as directed by the Engineer will be paid for as unforeseeable work.

In case of repeated failure on the part of the Contractor to control erosion, pollution, or siltation, the Engineer reserves the right to employ outside assistance or to use the City's own forces to provide the necessary corrective measures. Any such costs incurred, including engineering costs, will be charged to the Contractor and appropriate deductions made from the monthly progress estimate.

Payment will be made under:

Item No. 104- 1-	Artificial Coverings/ Rolled Erosion Control Products - per square yard.
Item No. 104- 6-	Slope Drains (Temporary)/ Runoff Control Structures - per foot.
Item No. 104- 7-	Sediment Basins/ Containment Systems - each.
Item No. 104- 9-	Sediment Basin/ Containment system Cleanouts - each.
Item No. 104- 10-	Sediment Barriers – per foot
Item No. 104- 11-	Floating Turbidity Barrier - per foot. Item
No. 104- 12-	Staked Turbidity Barrier - per foot. Item
No. 104- 18	Inlet Protection System – each.
Item No. 104- 19	Chemical Treatment – per square yard.
Item No. 104 – 20	Chemical Treatment (floc logs, drums of product) - each.

SECTION 108 - MONITOR EXISTING STRUCTURES

108-1 Description.

Provide settlement, vibration and groundwater monitoring in accordance with the requirements of this Section. The work required under this Section does not modify the requirements or responsibilities for preservation of existing property from damage in accordance with 7-11.1.

Evaluate the need for, design of, and provide any necessary precautionary features to protect existing structures from damage. Employ construction methods that will not produce damaging vibrations, soil movement, soil loss, or instability of existing structures.

108-2 Construction.

108-2.1 Inspection and Settlement Monitoring:

108-2.1.1 Miscellaneous Structures: When constructing foundations for miscellaneous structures such as sign, signal, lighting, or intelligent transportation system structures, inspect and document the condition of the existing structures shown in the Plans, and survey and monitor for settlement the existing structures shown in the Plans.

108-2.1.2 Structures other than Miscellaneous: When excavating or constructing retaining walls and foundations for bridges, buildings, and structures other than miscellaneous structures, inspect and document the condition of the following existing structures, and survey and monitor for settlement the following existing structures:

1. as shown in the Plans.
2. within a distance of five shaft or auger cast pile diameters, or the estimated depth of drilled shaft or auger cast pile excavation, whichever is greater, measured from the center of these foundation elements.
3. within a distance of three times the depth of any other excavations.
4. within 200 feet of sheet pile installation and extraction operations.
5. within 100 feet of steel soldier pile installation and extraction operations.
6. for projects with pile driving operations, inspect and document the condition of all structures within a distance, in feet, of pile driving operations equal to 0.25 times the square root of the impact hammer energy, in foot-pounds. Survey and monitor for settlement all structures within a distance, in feet, of pile driving operations equal to 0.5 times the square root of the impact hammer energy, in foot-pounds.

108-2.1.3 Roadway Compaction Operations: When performing embankment and asphalt compaction, inspect and document the condition of the following existing structures, and survey and monitor for settlement the following existing structures:

1. as shown in the Plans.
2. within 75 feet of vibratory compaction (in any mode) operations.

108-2.1.4 Inspection and Documentation Requirements: Inspect and document the condition of the existing structures and all existing cracks with descriptions and pictures using a qualified Specialty Engineer. Prepare two reports documenting the condition of the structures: one report before beginning the construction operations that may affect the existing structures such as but not limited to foundation construction, excavations, vibratory compaction, dewatering and retaining wall construction, and a second report after completing such construction operations. Include in the reports the Specialty Engineer's assessment of any

damage present, and in the event of damage, the Specialty Engineer's assessment of whether the observed damage is the result of the construction operations. Submit both reports to the Engineer. Inspecting and documenting the condition of bridges, sign, signal, lighting and ITS structures owned by the City is not required except when shown in the Contract Documents.

The City will make the necessary arrangements to provide right of way entry to the existing structures.

108-2.1.5 Settlement Surveying and Monitoring Requirements: Obtain the Engineer's approval for the number and location of monitoring points. Survey and monitor the settlement of structures, recording elevations to 0.001 foot:

1. before beginning construction
2. daily, during the driving of any casings, piling, or sheeting,
3. daily, during compaction
4. daily, during foundation drilling
5. weekly, for two weeks after stopping pile driving
6. during excavation
7. during blasting
8. or, as directed by the Engineer

Upon either detecting movement of 0.005 feet or damage to the structure, immediately stop the construction operations affecting the structure, backfill any open excavations, notify the Engineer and submit a corrective action plan for acceptance by the Engineer.

108-2.2 Vibration Monitoring: When shown in the Contract Documents, employ a qualified Specialty Engineer to continuously monitor and record vibration levels at the structures shown in the Plans during the operation of any equipment causing vibrations or during blasting operations. Submit the vibration records to the Engineer within 24 hours of performing the monitoring activity. Provide vibration monitoring equipment capable of detecting velocities of
0.01 inches per second or less. Obtain the Engineer's approval of the number and locations of the monitoring points.

Upon either detecting vibration levels reaching 0.5 inches per second or damage to the structure, immediately stop the source of vibrations, backfill any open excavations, notify the Engineer and submit a corrective action plan for acceptance by the Engineer.

108-2.3 Groundwater Monitoring: Install a piezometer at the right of way line and near any existing structure that may be affected by dewatering operations, or as directed by the Engineer. Monitor the piezometer and record the groundwater elevation level each day that dewatering activities are performed and for one week after activities have ceased, or on a schedule approved by the Engineer. Notify the Engineer of any groundwater lowering near the structure of 12 inches or more.

108-3 Method of Measurement.

The quantities to be paid for will be lump sum, completed and accepted. No separate payment will be made for the design, furnishing, construction, and removal of precautionary features, such as but not limited to sheeting, shoring, or bracing, installed for protection of existing structures.

108-4 Basis of Payment.

Price and payment will be full compensation for all work and materials specified in this Section.

Payment will be made under:

Item No. 108- 1	Monitor Existing Structures - Inspection and Settlement Monitoring - lump sum.
Item No. 108- 2	Monitor Existing Structures - Vibration Monitoring - lump sum.
Item No. 108- 3	Monitor Existing Structures - Groundwater Monitoring - lump sum.

SECTION 120 - EXCAVATION AND EMBANKMENT

120-1 Description.

120-1.1 General: Excavate and construct embankments as required for the roadway, ditches, channel changes and borrow material. Use suitable excavated material or authorized borrow to prepare subgrades and foundations. Construct embankments in accordance with Design Standards, Index 505. Compact and dress excavated areas and embankments.

For excavation and backfilling of structures, comply with the requirements of Section 125. Excavate material for clearing and grubbing in accordance with the requirements of Section 110. Material displaced by the storm sewer or drainage structure system is not included in the earthwork quantities shown in the Plans.

120-1.2 Unidentified Areas of Contamination: When encountering or exposing any abnormal condition indicating the presence of contaminated materials, cease operations immediately in the vicinity and notify the Engineer. The presence of tanks or barrels; discolored earth, metal, wood, ground water, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal may indicate the presence of contaminated materials and must be treated with extreme caution.

Make every effort to minimize the spread of contamination into uncontaminated areas. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provisions adhere to all applicable laws, rules or regulations covering potentially hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

The Engineer will notify the District Contamination Impact Coordinator (DCIC) who will coordinate selecting and tasking the City's Contamination Assessment/Remediation Contractor (CAR). Provide access to the potentially contaminated area. Preliminary investigation by the CAR Contractor will determine the course of action necessary for site security and the steps necessary under applicable laws, rules, and regulations for additional assessment and/or remediation work to resolve the contamination issue.

The CAR Contractor will delineate the contamination areas, any staging or holding area required; and, in cooperation with the Prime Contractor and Engineer, develop a work plan that will provide the CAR Contractor's operations schedule with projected completion dates for the final resolution of the contamination issue.

The CAR Contractor will maintain jurisdiction over activities inside any outlined contaminated areas and any associated staging holding areas. The CAR Contractor will be responsible for the health and safety of workers within the delineated areas. Provide continuous access to these areas for the CAR Contractor and representatives of regulatory or enforcement agencies having jurisdiction.

Both Contractors will use the schedule as a basis for planning the completion of both work efforts. The Engineer may grant the Contract Time extensions according to the provisions of 8-7.3.2.

Cooperate with the CAR Contractor to expedite integration of the CAR Contractor's operations into the construction project. The Prime Contractor is not expected to

engage in routine construction activities, such as excavating, grading, or any type of soil manipulation, or any construction processes required if handling of contaminated soil, surface water or ground water is involved. All routine construction activities requiring the handling of

contaminated soil, surface water or groundwater will be by the CAR Contractor. Adjustments to quantities or to Contract unit prices will be made according to work additions or reductions on the part of the Prime Contractor in accordance with 4-3.

The Engineer will direct the Prime Contractor when operations may resume in the affected area.

120-2 Classifications of Excavation.

120-2.1 General: The City may classify excavation specified under this Section for payment as any of the following: regular excavation, subsoil excavation, lateral ditch excavation, and channel excavation.

If the proposal does not show subsoil excavation or lateral ditch excavation as separate items of payment, include such excavation under the item of regular excavation.

If the proposal shows lateral ditch excavation as a separate item of payment, but does not show channel excavation as a separate item of payment, include such excavation under the item of lateral ditch excavation. Otherwise, include channel excavation under the item of regular excavation.

120-2.2 Regular Excavation: Regular excavation includes roadway excavation and borrow excavation, as defined below for each.

120-2.2.1 Roadway Excavation: Roadway excavation consists of the excavation and the utilization or disposal of all materials necessary for the construction of the roadway, ditches, channel changes, etc., except as may be specifically shown to be paid for separately and that portion of the lateral ditches within the limits of the roadway right-of-way as shown in the Plans.

120-2.2.2 Borrow Excavation: Borrow excavation consists of the excavation and utilization of material from authorized borrow pits, including only material that is suitable for the
construction of roadway embankments or of other embankments covered by the Contract.

A Cost Savings Initiative Proposal (CSIP) submittal based on using borrow material from within the project limits will not be considered.

120-2.3 Subsoil Excavation: Subsoil excavation consists of the excavation and disposal of muck, clay, rock, or any other material that is unsuitable in its original position and that is excavated below the finished grading template. For stabilized bases and sand bituminous road mixes, consider the finished grading template as the top of the finished base, shoulders and slopes. For all other bases and rigid pavement, consider the finished grading template as the finished shoulder and slope lines and bottom of completed base or rigid pavement. For pond and ditches that identify the placement of a blanket material, consider the finished grading template as the bottom of the blanket material. Subsoil excavation also consists of the excavation of all suitable material within the above limits as necessary to excavate the unsuitable material. Consider the limits of subsoil excavation indicated in the Plans as being particularly variable, in accordance with the field conditions actually encountered.

The quantity of material required to replace the excavated material and to raise the elevation of the roadway to the bottom of the template will be paid for under embankment or borrow excavation (Truck Measure).

120-2.4 Lateral Ditch Excavation: Lateral ditch excavation consists of all excavation of inlet and outlet ditches to structures and roadway, changes in channels of streams, and ditches

parallel to the roadway right-of-way. Dress lateral ditches to the grade and cross-section shown in the Plans.

120-2.5 Channel Excavation: Channel excavation consists of the excavation and satisfactory disposal of all materials from the limits of the channel as shown in the Plans.

120-3 Preliminary Soils Investigations.

When the Plans contain the results of a soil survey, do not assume such data is a guarantee of the depth, extent, or character of material present.

120-4 Removal of Unsuitable Materials and Existing Roads.

120-4.1 Subsoil Excavation: Where muck, rock, clay, or other material within the limits of the roadway is unsuitable in its original position, excavate such material to the cross-sections shown in the Plans or indicated by the Engineer, and backfill with suitable material. Shape backfill material to the required cross-sections. Where the removal of plastic soils below the finished earthwork grade is required, meet a construction tolerance, from the lines shown in the plans as the removal limits, of plus or minus 0.2 feet in depth and plus or minus 6 inches (each side) in width.

120-4.2 Construction over Existing Old Road: Where a new roadway is to be constructed over an old one, plow or scarify the old road, and break it up full width, regardless of height of fill. If the Plans provide that paving materials may be incorporated into the fill, distribute such material in a manner so as not to create voids. Recompact the old road meeting the requirements of 120-10.2.

120-4.3 Obliterating Old Road: Where the Plans call for obliteration of portions of an old road outside of the proposed new roadway, obliterate such sections of the old road by grading to fill ditches and to restore approximately the original contour of the ground or a contour which produces a pleasing appearance.

120-5 Disposal of Surplus and Unsuitable Material.

120-5.1 Ownership of Excavated Materials: Dispose of surplus and excavated materials as shown in the Plans or, if the Plans do not indicate the method of disposal, take
ownership of the materials and dispose of them outside the right-of-way.

120-5.2 Disposal of Muck on Side Slopes: As an exception to the provisions of 120-5. 1, when approved by the Engineer, in rural undeveloped areas, the Contractor may place muck (A-8 material) on the slopes, or store it alongside the roadway, provided there is a clear distance of at least 6 feet between the roadway grading limits and the muck, and the Contractor dresses the muck to present a neat appearance. In addition, the Contractor may also dispose of this material by placing it on the slopes in developed areas where, in the opinion of the Engineer, this will result in an aesthetically pleasing appearance and will have no detrimental effect on the adjacent developments. Where the Engineer permits the disposal of muck or other unsuitable material inside the right-of-way limits, do not place such material in a manner which will impede the inflow or outfall of any channel or side ditches. The Engineer will determine the limits adjacent
to channels within which such materials may be disposed.

120-5.3 Disposal of Paving Materials: Unless otherwise noted, take ownership of paving materials, such as paving brick, asphalt block, concrete slab, sidewalk, curb and gutter, etc., excavated in the removal of existing pavements, and dispose of them outside the right-of-way. If the materials are to remain the property of the City, place them in neat piles as

directed. Existing limerock base that is removed may be incorporated in the stabilized portion of
the subgrade. If the construction sequence will allow, incorporate all existing limerock base into the project as allowed by the Contract Documents.

120-5.4 Disposal Areas: Where the Contract Documents require disposal of excavated materials outside the right-of-way, and the disposal area is not indicated in the Contract Documents, furnish the disposal area without additional compensation.

Provide areas for disposal of removed paving materials out of sight of the project and at least 300 feet from the nearest roadway right-of-way line of any State maintained road. If the materials are buried, disregard the 300 foot limitation.

120-6 Borrow.

120-6.1 Materials for Borrow: Do not open borrow pits until the Engineer has approved their location.

Do not provide borrow materials that are polluted as defined in Chapter 376 of the Florida Statutes (oil of any kind and in any form, gasoline, pesticides, ammonia, chlorine, and derivatives thereof, excluding liquefied petroleum gas) in concentrations above any local, State, or Federal standards.

Prior to placing any borrow material that is the product of soil incineration, provide the Engineer with a copy of the Certificate of Materials Recycling and Post Burn Analysis showing that the material is below all allowable pollutant concentrations.

120-6.2 Furnishing of Borrow Areas:

To obtain the Engineer's approval to use an off-site construction activity area that involves excavation such as a borrow pit or local aggregate pit, request in writing, a review for - cultural resources involvement. Send the request to the Division of Historical Resources (DHR), City of State, State Historic Preservation Officer, Tallahassee, FL. As a minimum, include in the request the Project Identification Number, the County, a description of the property with Township, Range, Section, etc., the dimensions of the area to be affected, and a location map. Do not start any work at the off-site construction activity area prior to receiving
clearance from the DHR that no additional research is warranted.

For certain locations, the DHR will require a Cultural Resources Assessment (CRA) Survey before approval can be granted. When this is required, secure professional archaeological services to complete an historical and archaeological survey report. Submit the report to the DHR and to the City. The Engineer will determine final approval or rejection of off-site construction activity areas based on input from the DHR.

Before receiving approval or before use of borrow areas, obtain written clearance from the Engineer concerning compliance with the Federal Endangered Species Act and other Wildlife Regulations as specified in 7-1.4 and Section 4(f) of the USDOT Act as specified in 7-
1.8.

The City will adjust Contract Time in accordance with 8-7 for any suspension of operations required to comply with this Article. The City will not accept any monetary claims due to delays or loss of off-site construction activity areas.

Except where the Plans specifically call for the use of a particular borrow or dredging area, the Contractor may substitute borrow or dredging areas of his own choosing provided the Engineer determines the materials from such areas meet the City's standards and other requirements for stability for use in the particular sections of the work in which it is to be

placed, and the Contractor absorbs any increase in hauling or other costs. Stake the corners of the proposed borrow area and provide the necessary equipment along with an operator in order for the Engineer to investigate the borrow area. The Engineer will determine test locations, collect samples, and perform tests to investigate the proposed borrow area based on soil strata and required soil properties. The Engineer will approve use of materials from the proposed area based on test results and project requirements. Final acceptance of materials will be based on Point of Use Test as described in 6-1.2.4.

Before using any borrow material from any substitute areas, obtain the Engineer's approval, in writing, for the use of the particular areas, and, where applicable, ensure that the Engineer has cross-sectioned the surface. Upon such written approval by the Engineer, consider the substitute areas as designated borrow areas.

When furnishing the dredging or borrow areas, supply the City with evidence that the necessary permits, rights, or waivers for the use of such areas have been secured.

Do not excavate any part of a Contractor furnished borrow area which is less than 300 feet from the right-of-way of the project or any State Road until the Engineer has approved a plan for landscaping and restoring the disturbed area. Perform this landscaping and land restoration at no expense to the City, prior to final acceptance of the project. Do not provide a borrow area closer than 25 feet to the right-of-way of any state road. In City furnished borrow pits, do not excavate material within 5 feet of adjacent property lines.

Upon completion of excavation, neatly shape, dress, grass, vegetate, landscape, and drain all exposed areas including haul roads, as necessary so as not to present an objectionable appearance.

Meet the requirements of Section 104 when furnishing borrow areas, regardless of location.

120-6.3 Borrow Material for Shoulder Build-up: When so indicated in the Plans, furnish borrow material with a specific minimum bearing value, for building up of existing shoulders. Blend materials as necessary to achieve this specified minimum bearing value prior to placing the materials on the shoulders. Take samples of this borrow material at the pit or blended stockpile. Include all costs of providing a material with the required bearing value in the Contract unit price for borrow material.

120-6.4 Haul Routes for Borrow Pits: Provide and maintain, at no expense to the City, all necessary roads for hauling the borrow material. Where borrow area haul roads or trails are used by others, do not cause such roads or trails to deteriorate in condition.

Arrange for the use of all non-public haul routes crossing the property of any railroad. Incur any expense for the use of such haul routes. Establish haul routes which will direct construction vehicles away from developed areas when feasible, and keep noise from hauling operations to a minimum. Advise the Engineer in writing of all proposed haul routes.

120-6.5 Authorization for Use of Borrow: When the item of borrow excavation is included in the Contract, use borrow only when sufficient quantities of suitable material are not available from roadway and drainage excavation, to properly construct the embankment, subgrade, and shoulders, and to complete the backfilling of structures. Do not use borrow material until so ordered by the Engineer, and then only use material from approved borrow pits.

120-7 Materials for Embankment.

120-7.1 Use of Materials Excavated From the Roadway and Appurtenances: Assume responsibility for determining the suitability of excavated material for use on the project in accordance with the applicable Contract Documents. Consider the sequence of work and maintenance of traffic phasing in the determination of the availability of this material.

120-7.2 General Requirements for Embankment Materials: Construct embankments of acceptable material including reclaimed asphalt pavement (RAP), recycled concrete aggregate (RCA) and portland cement concrete rubble, but containing no muck, stumps, roots, brush, vegetable matter, rubbish, reinforcement bar or other material that does not compact into a suitable and enduring roadbed. Do not use RAP or RCA in the top 3 feet of slopes and shoulders that are to be grassed or have other type of vegetation established. Do not use RAP or RCA in stormwater management facility fill slopes.

Remove all waste material designated as undesirable. Use material in embankment construction in accordance with plan details or as the Engineer directs.

Complete the embankment using maximum particle sizes (in any dimension) as follows:

1. In top 12 inches: 3-1/2 inches (in any dimension).
2. 12 to 24 inches: 6 inches (in any dimension).
3. In the depth below 24 inches: not to exceed 12 inches (in any dimension) or the compacted thickness of the layer being placed, whichever is less.

Spread all material so that the larger particles are separated from each other to minimize voids between them during compaction. Compact around these rocks in accordance with 120-9.2.

When and where approved by the Engineer, the Contractor may place larger rocks (not to exceed 18 inches in any dimension) outside the one to two slope and at least 4 feet or more below the bottom of the base. Compact around these rocks to a firmness equal to that of the supporting soil. Construct grassed embankment areas in accordance with 120-9.2.6. Where constructing embankments adjacent to bridge end bents or abutments, do not place rock larger than 3-1/2 inches in diameter within 3 feet of the location of any end-bent piling.

120-7.3 Materials Used at Pipes, Culverts, etc.: Construct embankments over and around pipes, culverts, and bridge foundations with selected materials.

120-8 Embankment Construction.

120-8.1 General: Construct embankments in sections of not less than 300 feet in length or for the full length of the embankment..

For construction of mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems, a LOT is defined as a single lift of finished embankment not to exceed 500 feet.

For construction of shoulder-only areas, shared use paths, and sidewalks areas, a LOT is defined as a single lift of finished embankment not to exceed 2000 feet.

Isolated compaction operations will be considered as separate LOTS. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

120-8.2 Dry Fill Method:

120-8.2.1 General: Construct embankments to meet compaction requirements in Article 120-9 and in accordance with the acceptance program requirements in 120-10. Restrict the compacted thickness of the last embankment lift to 6 inches maximum.

120-8.2.1.1 For A-3 Materials and for A-2-4 Materials (with up to

15% fines): Construct the embankment in successive layers with lifts up to a maximum compacted thickness of 12 inches. Ensure the percentage of fines passing the No. 200 US Standard sieve in the A-2-4 material does not exceed 15%.

120-8.2.1.2 For A-1, Plastic materials (as designated in Design Standard Index 505) and for A-2-4 Materials (with greater than 15% fines): Construct the embankment in successive layers with lifts up to a maximum compacted thickness of 6 inches.

Alternately, for A-1, Plastic material and for A-2-4 Materials (with greater than 15% fines), construct embankments using thick lift construction in successive layers of not more than 12 inches compacted thickness, after having demonstrated with a successful test section, the possession and control of compacting equipment sufficient to achieve density required by 120-10.2 for the full depth of a thicker lift, and if the Engineer approves the compaction effort. Notify the Engineer prior to beginning construction of a test section.
Construct a test section of the length of one full LOT. Perform five QC tests at random locations within the test section. All five QC tests and a City Verification test must meet the density required by 120-10.2. Identify the test section with the compaction effort and soil classification in the Density Log Book. In case of a change in compaction effort or soil classification, failing QC test or when the QC tests cannot be verified, construct a new test section. The Contractor may elect to place material in 6 inches compacted thickness at any time. Construct all layers approximately parallel to the centerline profile of the road.

The Engineer reserves the right to terminate the Contractor's use of thick lift construction. Whenever the Engineer determines that the Contractor is not achieving satisfactory results, revert to the 6 inch compacted lifts.

As far as practicable, distribute traffic over the work during the construction of embankments so as to cover the maximum area of the surface of each layer.

Construct embankment in the dry whenever normal dewatering equipment and methods can accomplish the needed dewatering.

120-8.2.1.3 Equipment and Methods: Provide normal dewatering equipment including, but not limited to, surface pumps, sump pumps and trenching/digging machinery. Provide normal dewatering methods including, but not limited to, constructing shallow surface drainage trenches/ditches, using sand blankets, sumps and siphons.

When normal dewatering does not adequately remove the water, the Engineer may require the embankment material to be placed in the water or on low swampy ground in accordance with 120-9.2.3.

120-8.2.2 Placing in Unstable Areas: Where depositing the material in water, or on low swampy ground that will not support the weight of hauling equipment, construct the embankment by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. Once sufficient material has been placed so that the hauling equipment can be supported, construct the remaining portion of the embankment in layers in accordance with the applicable provisions of
120-9.2.2 and 120-9.2.4.

120-8.2.3 Placing on Steep Slopes: When constructing an embankment on a hillside sloping more than 20 degrees from the horizontal, before starting the fill, deeply plow or cut steps into the surface of the original ground on which the embankment is to be placed.

120-8.2.4 Placing Outside Standard Minimum Slope: The standard minimum slope is defined as the plane described by a two (horizontal) to one (vertical) slope downward

from the roadway shoulder line or the gutter line, as applicable. Where material that is unsuitable for normal embankment construction is to be used in the embankment outside the standard minimum slope, place such material in layers of not more than 18 inches in thickness, measured loose. The Contractor may also place material which is suitable for normal embankment, outside such standard minimum slope, in 18 inch layers. Maintain a constant thickness for suitable material placed within and outside the standard minimum slope, unless placing in a separate operation.

120-8.3 Hydraulic Method:

120-8.3.1 Method of Placing: When the hydraulic method is used, as far as practicable, place all dredged material in its final position in the embankment by such method. Place and compact any dredged material that is rehandled, or moved and placed in its final position by any other method, as specified in 120-9.2. The Contractor may use baffles or any form of construction he may select provided the slopes of the embankments are not steeper than indicated in the Plans. Remove all timber used for temporary bulkheads or baffles from the embankment, and fill and thoroughly compact the holes thus formed. When placing fill on submerged land, construct dikes prior to beginning of dredging, and maintain the dikes throughout the dredging operation.

120-8.3.2 Excess Material: Do not use excess material placed outside the prescribed slopes, below the normal high-water level, to raise the fill. Remove only the portion of this material required for dressing the slopes.

120-8.3.3 Protection of Openings in Embankment: Leave openings in the embankments at the bridge sites. Remove any material which invades these openings or existing channels without additional compensation to provide the same depth of channel as existed before the construction of the embankment. Do not excavate or dredge any material within 200 feet of the toe of the proposed embankment.

120-8.4 Reclaimed Asphalt Pavement (RAP) Method:

120-8.4.1 General: Use only RAP material stored at facilities with an approved Florida City of Environmental Protection Stormwater permit or, transferred directly from a milling project to the City project. Certify the source if RAP material is from an identifiable City project. Do not use RAP material in the following areas: construction areas that are below the seasonal high groundwater table elevation; MSE Wall backfill; underneath MSE Walls or the top 6 inches of embankment.

Prior to placement, submit documentation to the Engineer for his approval, outlining the proposed location of the RAP material.

120-8.4.2 Soil and RAP Mixture: Place the RAP material at the location and spread uniformly**,** using approved methods to obtain a maximum layer thickness of 4 inches. Mix this 4 inches maximum layer of RAP with a loose soil layer 8 to 10 inches thick. After mixing, meet all embankment utilization requirements of Design Standards, Index No. 505 for the location used. Do not mix RAP in the uppermost 12 inches in order to comply with 120-8.2.1. The total RAP and other embankment material shall not exceed 12 inches per lift after mixing and compaction if the contractor can demonstrate that the density of the mixture can be achieved. Perform mixing using rotary tillers or other equipment meeting the approval of the Engineer. The Engineer will determine the order in which to spread the two materials. Mix both materials to the full depth. Ensure that the finished layer will have the thickness and shape required by the typical section. Demonstrate the feasibility of this construction method by successfully completing a 500 foot long test section. For embankment construction, meet the requirements of 120-8. For compaction requirements of the soil and RAP mixture, meet the requirements of 120-9.

120-8.4.3 Alternate Soil and RAP Layer Construction: Construct soil in 6 to

12 inch compacted lifts and RAP in alternate layers with 6 inch maximum compacted lifts. Use soil with a minimum LBR value of 40 to prevent failure during compaction of the overlying RAP layer. Demonstrate the feasibility of this construction method by successfully completing a 500 foot long test section. For compaction requirements of both soil and RAP, meet the requirements of 120-9**.**

120-9 Compaction Requirements.

120-9.1 Moisture Content: Compact the materials at a moisture content such that the specified density can be attained. If necessary to attain the specified density, add water to the material, or lower the moisture content by manipulating the material or allowing it to dry, as is appropriate.

120-9.2 Compaction of Embankments:

120-9.2.1 General: Uniformly compact each layer, using equipment that will achieve the required density, and as compaction operations progress, shape and manipulate each layer as necessary to ensure uniform density throughout the embankment.

120-9.2.2 Compaction Over Unstable Foundations: Where the embankment material is deposited in water or on low swampy ground, and in a layer thicker than 12 inches (as provided in 120-8.2.2), compact the top 6 inches (compacted thickness) of such layer to the density as specified in 120-10.2.

120-9.2.3 Compaction Where Plastic Material Has Been Removed: Where unsuitable material is removed and the remaining surface is of the A-4, A-5, A-6, or A-7 Soil Groups (see AASHTO M-145), as determined by the Engineer, compact the surface of the excavated area by rolling with a sheepsfoot roller exerting a compression of at least 250 psi on the tamper feet, for the full width of the roadbed (subgrade and shoulders). Perform rolling
before beginning any backfill, and continue until the roller feet do not penetrate the surface more than 1 inch. Do not perform such rolling where the remaining surface is below the normal water table and covered with water. Vary the procedure and equipment required for this operation at
the discretion of the Engineer.

120-9.2.4 Compaction of Material To Be Used In Base, Pavement, or Stabilized Areas: Do not compact embankment material which will be incorporated into a pavement, base course, or stabilized subgrade, to be constructed as a part of the same Contract.

120-9.2.5 Compaction of Grassed Shoulder Areas: For the upper 6 inch layer of all shoulders which are to be grassed, since no specific density is required, compact only to the extent directed.

120-9.2.6 Compaction of Grassed Embankment Areas: For the outer layer of all embankments where plant growth will be established, do not compact. Leave this layer in a loose condition to a minimum depth of 6 inches for the subsequent seeding or planting operations.

120-9.3 Compaction for Pipes, Culverts, etc.: Compact the backfill of trenches to the densities specified for embankment or subgrade, as applicable, and in accordance with the requirements of 125-9.2.

Thoroughly compact embankments over and around pipes, culverts, and bridges in a manner which will not place undue stress on the structures, and in accordance with the requirements of 125-9.2.

120-9.4 Compaction of Subgrade: If the Plans do not provide for stabilizing, compact the subgrade (as defined in 1-3) in both cuts and fills, to the density specified in 120-10.2. For

undisturbed soils, do not apply density requirements where constructing narrow widening strips or paved shoulders 5 feet or less in width.

Where trenches for widening strips are not of sufficient width to permit the use of standard compaction equipment, perform compaction using vibratory rollers, trench rollers, or other type compaction equipment approved by the Engineer.

Maintain the required density until the base or pavement is placed on the subgrade.

120-10 Acceptance Program.

120-10.1 General Requirements:

120-10.1.1 Initial Equipment Comparison: Before initial production, perform a comparison test using the QC, Verifications and Independent Assurance gauges. Unless the Engineer instructs, do not perform the initial equipment comparison more than once per project. When comparing the computed dry density of one nuclear gauge to a second gauge, ensure that the difference between the two computed dry densities does not exceed 2 lb/ft^3 between gauges from the same manufacturer, and 3 lb/ft^3 between gauges from different manufacturers. Repair or replace any QC gauge that does not compare favorably with the IA gauge.

Perform a comparison analysis between the QC nuclear gauge and the Verification nuclear gauge any time a nuclear gauge or repaired nuclear gauge is first brought to the project. Repair and replace any QC gauge that does not compare favorably with the Verification gauge at any time during the remainder of the project. Calibrate all QC gauges annually.

120-10.1.2 Initial Production Lot: Before construction of any other LOT, prepare a 500 foot initial control section consisting of one full LOT. Notify the Engineer at least 24 hours prior to production of the initial control section. Perform all QC tests required in 120-10.1.4. When the initial QC test results pass specifications, the Engineer will perform a Verification test to verify compliance with the specifications. Do not begin constructing another LOT until successfully completing the initial production LOT. The Engineer will notify the Contractor of the initial production lot approval within three working days after receiving the Contractor's QC data when test results meet the following conditions:

1. QC tests must meet the specifications.
2. Verification test must meet the specifications.
3. Difference between QC and Verification computed dry density results shall meet the requirements of 120-10.1.1.

If Verification test result fails the density requirements of 120-10.2, correct the areas of non-compliance. The QC and Verification tests will then be repeated.

120-10.1.3 Density over 105%: When a QC computed dry density results in a value greater than 105% of the applicable Proctor maximum dry density, the Engineer will perform an Independent Verification density test within 5 feet. If the Independent Verification density results in a value greater than 105%, the Engineer will investigate the compaction methods, examine the applicable Standard Proctor Maximum Density and material description. The Engineer may collect and test an Independent Verification Standard Proctor Maximum Density sample for acceptance in accordance with the criteria of 120-10.2.

120-10.1.4 Quality Control (QC) Tests:

120-10.1.4.1 Standard Proctor Maximum Density Determination: Determine the QC standard Proctor maximum density and optimum moisture content by

sampling and testing the material in accordance with the specified test method listed in 120-10.2.

120-10.1.4.2 Density Testing Requirements: Ensure compliance to the requirements of 120-10.2 by Nuclear Density testing in accordance with FM 1-T 238. Determine the in-place moisture content for each density test. Use FM 1-T 238, FM 5-507 (Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester), or ASTM D-4643 (Laboratory Determination of Moisture Content of Granular Soils by use of a Microwave Oven) for moisture determination.

120-10.1.4.3 Soil Classification: Perform soil classification tests on the sample collected in 120-10.1.4.1, in accordance with AASHTO T-88. Classify soils in accordance with AASHTO M-145 in order to determine compliance with embankment utilization requirements. Unless required by the Engineer, do not test or classify materials for stabilized subgrade or base.

120-10.1.5 City Verification: The Engineer will conduct Verification tests in order to accept all materials and work associated with 120-10.1.4. The Engineer will verify the QC results if they meet the Verification Comparison Criteria, otherwise the Engineer will implement Resolution procedures.

The Engineer will select test locations, including Station, Offset, and Lift, using a Random Number generator based on the Lots under consideration. Each Verification test evaluates all work represented by the QC testing completed in those LOTs.

In addition to the Verification testing, the Engineer may perform additional Independent Verification (IV) testing. The Engineer will evaluate and act upon the IV test results in the same manner as Verification test results.

When the project requires less than four QC tests per material type, the Engineer reserves the right to accept the materials and work through visual inspection.

120-10.1.6 Reduced Testing Frequency: When no Resolution testing is required for 12 consecutive verified LOTs; or if required, the QC test data was upheld, reduce the QC density testing to one test every two LOTs by identifying the substantiating tests in the Density Log Book and notifying the Engineer in writing prior to starting reduced frequency of testing. Generate random numbers based on the two LOTs under consideration. When QC test frequency is reduced to one every two LOTs, obtain the Engineer's approval to place more than one LOT over an untested LOT. Assure similar compaction efforts for the untested LOTs. If the Verification test fails, and QC test data is not upheld by Resolution testing, the QC testing will revert to the original frequency of one QC test per LOT. Do not apply reduced testing frequency in construction of shoulder-only areas, shared use paths and sidewalks.

120-10.1.7 Payment for Resolution Tests: If the Resolution laboratory results compare favorably with the QC results, the City will pay for Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution laboratory results do not compare favorably with the QC results, the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing.

120-10.2 Acceptance Criteria: Obtain a minimum QC density of 100% of the standard Proctor maximum density as determined by AASHTO T-99, Method C, with the following exceptions: embankment constructed by the hydraulic method as specified in 120-8.3; material placed outside the standard minimum slope as specified in 120-8.2.4 except when a structure is supported on existing embankment; and, other areas specifically excluded herein.

120-10.3 Additional Requirements:

120-10.3.1 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification of Shoulder-Only Areas, Shared Use Paths, and Sidewalks
Standard Proctor Maximum Density	One per soil type	One per soil type	One per soil type
Density	One per LOT	One per four LOTS and for wet conditions, the first lift not affected by water	One per two LOTs
Soil Classification	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density

120-10.3.2 Test Selection and Reporting: Determine test locations including Stations and offsets, using the random number generator approved by the Engineer. Do not use note pads or work sheets to record data for later transfer to the Density Log Book. Notify the Engineer upon successful completion of QC testing on each LOT.

120-10.4 Verification Comparison Criteria and Resolution Procedures:

120-10.4.1 Standard Proctor Maximum Density Determination: The Engineer will verify the QC results if the results compare within 4.5 lb/ft^3 of the Verification test result. Otherwise, the Engineer will take one additional sample of material from the soil type in question. The State Materials Office (SMO) or an AASHTO accredited laboratory designated by the SMO will perform Resolution testing. The material will be sampled and tested in accordance with AASHTO T-99, Method C.

The Engineer will compare the Resolution test results with the QC test results. If all Resolution test results are within 4.5 lb/ft^3 of the corresponding QC test results, the Engineer will use the QC test results for material acceptance purposes for each LOT with that soil type. If the Resolution test result is not within 4.5 lb/ft^3 of the Contractor's QC test, the Verification test result will be used for material acceptance purposes.

120-10.4.2 Density Testing: When a Verification or Independent Verification density test fails the Acceptance Criteria, retest the site within a 5 feet radius and the following actions will be taken:

1. If the QC retest meets the Acceptance Criteria and meets the 120-10.1.1 criteria when compared with the Verification or Independent Verification test, the Engineer will accept those LOTs.

2. If the QC retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, rework and retest the LOT. The Engineer will re-verify those LOTs.

3. If the QC retest and the Verification or Independent Verification test do not compare favorably, complete a new comparison analysis as defined in 120-10.1.1. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

Record QC test results in the density log book on approved City forms provided by the Engineer. Submit the original, completed density log book to the Engineer at final acceptance.

120-10.4.3 Soil Classification: The Engineer will verify the QC results if the Verification results identify matching soil classifications. Otherwise, the Engineer will take one additional sample of material from the soil type in question. The SMO or an AASHTO accredited laboratory designated by the SMO will perform Resolution testing. The material will be sampled and tested in accordance with AASHTO T-88.

The Engineer will compare the Resolution test results with the QC test results. If the Resolution test matches the QC classification, the Engineer will use the QC classification for material acceptance purposes. If the Resolution test result does not match the Contractor's QC classification, the Verification test result will be used for material acceptance purposes.

120-11 Maintenance and Protection of Work.

While construction is in progress, maintain adequate drainage for the roadbed at all times. Maintain a shoulder at least 3 feet wide adjacent to all pavement or base construction in order to provide support for the edges.

Maintain all earthwork construction throughout the life of the Contract, and take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. Repair, at no expense to the City except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work. Perform maintenance and protection of earthwork construction in accordance with Section 104.

Maintain all channels excavated as a part of the Contract work against natural shoaling or other encroachments to the lines, grades, and cross-sections shown in the Plans, until final acceptance of the project.

120-12 Construction.

120-12.1 Construction Tolerances: Shape the surface of the earthwork to conform to the lines, grades, and cross-sections shown in the Plans. In final shaping of the surface of earthwork, maintain a tolerance of 0.3 foot above or below the plan cross-section with the following exceptions:

1. Shape the surface of shoulders to within 0.1 foot of the plan cross-section.
2. Shape the earthwork to match adjacent pavement, curb, sidewalk, structures, etc.
3. Shape the bottom of ditches so that the ditch impounds no water.
4. When the work does not include construction of base or pavement, shape the entire roadbed (shoulder point to shoulder point) to within 0.1 foot above or below the Plan cross-section.

Ensure that the shoulder lines do not vary horizontally more than 0.3 foot from the true lines shown in the Plans.

120-12.2 Operations Adjacent to Pavement: Carefully dress areas adjacent to pavement areas to avoid damage to such pavement. Complete grassing of shoulder areas prior to

placing the final wearing course. Do not manipulate any embankment material on a pavement surface.

When shoulder dressing is underway adjacent to a pavement lane being used to maintain traffic, exercise extreme care to avoid interference with the safe movement of traffic.

120-13 Method of Measurement.

120-13.1 General: When payment for excavation is on a volumetric basis, the quantity to be paid for will be the volume, in cubic yards, calculated by the method of average end areas, unless the Engineer determines that another method of calculation will provide a more accurate result. The material will be measured in its original position by field survey or by photogrammetric means as designated by the Engineer, unless otherwise specified under the provisions for individual items.

Where subsoil excavation extends outside the lines shown in the Plans or authorized by the Engineer including allowable tolerances, and the space is backfilled with material obtained in additional authorized roadway or borrow excavation, the net fill, plus shrinkage allowance, will be deducted from the quantity of roadway excavation or borrow excavation to be paid for, as applicable.

The quantity of all material washed, blown, or placed beyond the authorized roadway cross-section will be determined by the Engineer and will be deducted from the quantity of roadway excavation or borrow excavation to be paid for, as applicable.

Subsoil excavation that extends outside the lines shown in the Plans or authorized by the Engineer including allowable tolerances will be deducted from the quantity to be paid for as subsoil excavation.

120-13.2 Roadway Excavation: The measurement will include only the net volume of material excavated between the original ground surface and the surface of the completed earthwork, except that the measurement will also include all unavoidable slides which may occur in connection with excavation classified as roadway excavation.

The pay quantity will be the plan quantity provided that the excavation was accomplished in substantial compliance with the plan dimensions and subject to the provisions of
9-3.2 and 9-3.4. On designated 3-R Projects, regular excavation will be paid for at the Contract lump sum price provided that the excavation was accomplished in substantial compliance with the plan dimension.

120-13.3 Borrow Excavation: Measurement will be made on a loose volume basis, measured in trucks or other hauling equipment at the point of dumping on the road. If measurement is made in vehicles, level the material to facilitate accurate measurement.

Unsuitable material excavated from borrow pits where truck measurement is provided for and from any borrow pits furnished by the Contractor, will not be included in the quantity of excavation to be paid for.

120-13.4 Lateral Ditch Excavation: The measurement will include only material excavated within the lines and grades indicated in the Plans or as directed by the Engineer. The measurement will include the full station-to-station length shown in the Plans or directed by the Engineer and acceptably completed. Excavation included for payment under Section 125 will not be included in this measurement.

The pay quantity will be the plan quantity provided that the excavation was accomplished in substantial compliance with the plan dimensions and subject to the provisions of
9-3.2 and 9-3.4.

120-13.5 Channel Excavation: The measurement will include only material excavated within the lines and grades indicated in the Plans or in accordance with authorized Plan changes. The measurement will include the full station-to-station length shown in the Plans including any authorized changes thereto.

If shoaling occurs subsequent to excavation of a channel and the Engineer authorized the shoaled material to remain in place, the volume of any such material remaining within the limits of channel excavation shown in the Plans will be deducted from the measured quantity of channel excavation.

120-13.6 Subsoil Excavation: The measurement will include only material excavated within the lines and grades indicated in the Plans (including the tolerance permitted therefore) or as directed by the Engineer.

When no item for subsoil excavation is shown in the Contract but subsoil excavation is subsequently determined to be necessary, such unanticipated subsoil excavation will be paid for as provided in 4-4.

120-13.7 Embankment: The quantity will be at the plan quantity.

Where payment for embankment is not to be included in the payment for the excavation, and is to be paid for on a cubic yard basis for the item of embankment, the plan quantities to be paid for will be calculated by the method of average end areas unless the Engineer determines that another method of calculation will provide a more accurate result. The

measurement will include only material actually placed above the original ground line, within the lines and grades indicated in the Plans or directed by the Engineer. The length used in the computations will be the station-to-station length actually constructed. The original ground line used in the computations will be as determined prior to placing of embankment subject to the provisions of 9-3.2, and no allowance will be made for subsidence of material below the surface of the original ground.

If there are authorized changes in plan dimensions or if errors in plan quantities are detected, plan quantity will be adjusted as provided in 9-3.2.

Where the work includes excavation of unsuitable material below the finished grading template or original ground line, whichever is lower as defined in 120-3.3, the original ground line is defined as the surface prior to beginning excavation, except that this surface is not outside the permissible tolerance of lines and grades for subsoil excavation as indicated in the Plans or as directed by the Engineer. Any overrun or underrun of plan quantity for subsoil excavation which results in a corresponding increase or decrease in embankment will be considered as an authorized plan change for adjustment purposes as defined in 9-3.2.2.

No payment will be made for embankment material used to replace unsuitable material excavated beyond the lines and grades shown in the Plans or ordered by the Engineer.

In no case will payment be made for material allowed to run out of the embankment on a flatter slope than indicated on the cross-section. The Contractor shall make his own estimate on the volume of material actually required to obtain the pay section.

120-14 Basis of Payment.

120-14.1 General: Prices and payments for the various work items included in this Section will be full compensation for all work described herein, including excavating, dredging, hauling, placing, and compacting; dressing the surface of the earthwork; maintaining and protecting the complete earthwork; and hauling.

The City will not allow extra compensation for any rehandling of materials.

The City will compensate for the cost of grassing or other permanent erosion control measures directed by the Engineer as provided in the Contract for similar items of roadway work.

120-14.2 Excavation:

120-14.2.1 Items of Payment: When no classification of material is indicated in the Plans, and bids are taken only on regular excavation, the total quantity of all excavation specified under this Section will be paid for at the Contract unit price for regular excavation.

When separate classifications of excavation are shown in the proposal, the quantities of each of the various classes of materials so shown will be paid for at the Contract
unit prices per cubic yard for regular excavation, lateral ditch excavation, subsoil excavation, and channel excavation, as applicable, and any of such classifications not so shown will be included under the item of regular excavation (except that if there is a classification for lateral ditch excavation shown and there is no classification for channel excavation, any channel excavation will be included under the item of lateral ditch excavation). As an exception on designated projects, regular excavation will be paid for at the Contract lump sum price.

120-14.2.2 Basic Work Included in Payments: Prices and payments will be full compensation for all work described under this Section, except for any excavation, or embankment which is specified to be included for payment under other items. Such prices and payments will include hauling; any rehandling that may be necessary to accomplish final disposal as shown in the Plans; the dressing of shoulders, ditches and slopes; removal of trash, vegetation, etc., from the previously graded roadway where no item for clearing and grubbing is shown in the Plans; and compacting as required.

120-14.2.3 Additional Depth of Subsoil Excavation: Where subsoil excavation is made to a depth of 0 to 5 feet below the depth shown in the Plans, such excavation will be paid for at the unit price bid.

Where subsoil excavation is made to a depth greater than 5 feet, and up to 15 feet, deeper than the depth shown in the Plans, such excavation will be paid for at the unit price bid plus 25% of such unit price. Additional extra depth, more than 15 feet below such plan depth, will be considered as a change in the character of the work and will be paid for as unforeseeable work.

Where no subsoil excavation is shown in a particular location on the original Plans, payment for extra depth of subsoil will begin 5 feet below the lowest elevation on the grading template.

120-14.2.4 Borrow Excavation: When the item of borrow excavation is included in the Contract, price and payment will also include the cost of furnishing the borrow areas and any necessary clearing and grubbing thereof, the removal of unsuitable material that it is necessary to excavate in order to obtain suitable borrow material, and also the costs incurred in complying with the provisions of 120-6.3.

120-14.2.5 Materials Excluded from Payment for the Excavation: No payment for excavation will be made for any excavation covered for payment under the item of embankment.

No payment will be made for the excavation of any materials which is used for purposes other than those shown in the Plans or designated by the Engineer. No payment will be made for materials excavated outside the lines and grades given by the Engineer, unless specifically authorized by the Engineer. As an exception, in operations of roadway excavation, all slides and falls of insecure masses of material beyond the regular slopes that are not due to lack of precaution on the part of the Contractor, will be paid for at the Contract unit price for the material involved. The removal of slides and falls of material classified as lateral ditch excavation or as subsoil excavation will not be paid for separately, but

will be included in the Contract unit price for the pay quantity of these materials, measured as provided in 120-14.

120-14.3 Embankment:

120-14.3.1 General: Price and payment will be full compensation for all work specified in this Section, including all material for constructing the embankment, all excavating, dredging, pumping, placing and compacting of material for constructing the embankment complete, dressing of the surface of the roadway, maintenance and protection of the completed earthwork, and the removal of rubbish, vegetation, etc., from the roadway where no clearing and grubbing of the area is specified in the Plans. Also, such price and payment, in each case, will specifically include all costs of any roadway, lateral ditch, or channel excavation, unless such excavation is specifically shown to be paid for separately, regardless of whether the materials are utilized in the embankment.

120-14.3.2 Excluded Material: No payment will be made for the removal of muck or overburden from the dredging or borrow areas. No payment will be made for embankment material used to replace muck or other unsuitable material excavated beyond the lines and grades shown in the Plans or ordered by the Engineer.

120-14.3.3 Clearing and Grubbing: No payment will be made for any clearing and grubbing of the borrow or dredging areas. Where no clearing and grubbing of such areas is specified in the Plans, the cost of any necessary clearing and grubbing will be included in the Contract unit or lump sum price for Embankment.

120-14.3.4 Cost of Permits, Rights, and Waivers: Where the Contractor provides borrow or dredging areas of his own choosing, the cost of securing the necessary permits, rights or waivers will be included in the Contract price for embankment.

120-14.4 Payment Items: Payment will be made under:

Item No. 120- 1- Regular Excavation - per cubic yard.
Item No. 120- 2- Borrow Excavation - per cubic yard.
Item No. 120- 3- Lateral Ditch Excavation - per cubic yard.
Item No. 120- 4- Subsoil Excavation - per cubic yard.
Item No. 120- 5- Channel Excavation - per cubic yard.
Item No. 120- 6- Embankment - per cubic yard.
Item No. 120- 71- Regular Excavation (3-R Projects) - lump sum.

SECTION 121 - FLOWABLE FILL

121-1 Description.

Furnish and place flowable fill as an alternative to compacted soil as approved by the Engineer. Applications for conventional flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for trenches, embankments and walls. Applications for cellular concrete flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for embankments and walls.

121-2 Materials.

Meet the following requirements:

Fine Aggregate(1).....Section 902
Portland Cement (Types I, II, or III).....Section 921
Water.....Section 923
Admixtures(2).....Section 924
Ground Tire Rubber (GTR)(3).....Section 919
Fly Ash, Slag and other Pozzolanic Materials....Section 929
Preformed Foam.....ASTM C 869

1. Any clean fine aggregate with 100% passing a 3/8 inch mesh sieve and not more than 15% passing a No. 200 sieve may be used.

2. High air generators or foaming agents may be used in lieu of conventional air entraining admixtures and shall be added at jobsite and mixed in accordance with the manufacturer's recommendation. GTR may reduce the amount of high air generators or foaming agents used.

3. GTR may replace up to 20% of the fine aggregate.

121-3 Mix Design.

Conventional flowable fill is a mixture of portland cement, fly ash, fine aggregate, admixture and water. Flowable fill contains a low cementitious content for reduced strength development. Cellular concrete flowable fill is a low density concrete made with cement, water and preformed foam to form a hardened closed cell foam material. Cellular concrete flowable fill may also contain fine aggregate, fly ash, slag and admixtures.

Submit mix designs to the Engineer for approval. The following are suggested mix guides for excavatable, non-excavatable and cellular concrete flowable fill:

	Excavatable	Non-Excavatable	Cellular Concrete
Cement	75-100 lb/yd^3	75-150 lb/yd^3	Min 150 lb/yd^3
Pozzolans or Slag	None	150-600 lb/yd^3	Optional
Water	*	*	*
Air**	5-35%	5-15%	****
28 Day Compressive Strength**	Maximum 100 psi	Minimum 125 psi	Minimum 80 psi
Unit Weight **	90-110 lb/ft^3	100-125 lb/ft^3	20-80 lb/ft^3
Fine Aggregate	***	***	Optional

	Excavatable	Non-Excavatable	Cellular Concrete
*Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement. **The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements. ***Fine Aggregate shall be proportioned to yield 1 yd^3. ****In cellular concrete, preformed foam shall be proportioned at the job site to yield 1 yd^3 in accordance with the design requirements.			

121-4 Production and Placing.

Use flowable fill manufactured at a production facility that meets the requirements of 347-3. Deliver flowable fill using concrete construction equipment. Revolution counter are waived. Place flowable fill by chute, pumping or other methods approved by the Engineer. Tremie flowable fill through water. Cellular concrete flowable fill may not be placed within three feet of the bottom elevation for roadway base courses.

121-5 Construction Requirements.

Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur.

Protect flowable fill from freezing for a period of 36 hours after placement.

Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40ºF. Take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

121-6 Acceptance.

Acceptance of flowable fill will be based on the following documentation and a minimum temperature of flowable fill at the point of delivery of 50ºF.

Submit a delivery ticket to the Engineer for each load of flowable fill delivered to the worksite. Ensure that each ticket contains the following information:

1. Project designation,
2. Date,
3. Time,
4. Class and quantity of flowable fill,
5. Actual batch proportions,
6. Free moisture content of aggregates,
7. Quantity of water withheld.

Leave the fill undisturbed until the material obtains sufficient strength. Sufficient strength is 35 psi penetration resistance as measured using a hand held penetrometer in accordance with ASTM C-403. Provide a hand held penetrometer to measure the penetration resistance of the hardened flowable fill.

121-7 Basis of Payment.

When the item of flowable fill is included in the Contract, payment will be made at the Contract unit price per cubic yard. Such price and payment will include all cost of the mixture, in place and accepted, determined as specified above. No measurement and payment will be made for material placed outside the neat line limits or outside the adjusted limits, or for unused or wasted material.

Payment will be made under:

Item No. 121- 70- Flowable Fill - per cubic yard.

SECTION 160
STABILIZING

160-1 Description.

Stabilize designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the Plans.

160-2 Materials.

160-2.1 Commercial Material: Meet the requirements of Section 914-2.1.

160-2.2 Local Material: Meet the requirements of Section 914.Test material from each source, or if authorized by the Engineer, test blended materials. Submit test results to the Engineer at least 14 days prior to the stabilization operation.

160-2.2.1 Reclaimed Asphalt Pavement (RAP) (Same Project): The Engineer may allow the use of RAP material from the same project that is free of contaminants without testing the source.

160-2.2.2 Reclaimed Asphalt Pavement (RAP) (Different Project) or RAP Blended Material: When RAP is obtained from another project, the Engineer will determine the acceptability of the material.

160-2.3 Existing Base: When the material from an existing base is used as all, or a portion, of the stabilizing additives, no further testing is required unless directed by the Engineer.

160-2.4 Granular Subbase: The Engineer may allow, at no additional cost to the City, the substitution of 6 inches of granular subbase meeting the requirements of 290-2 and 290-3, when 12 inches of stabilization requiring a limerock bearing ratio (LBR) value of 40 is specified.

160-3 Construction Methods.

160-3.1 General: Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the Plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

Construct mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems meeting the requirements of 120-8.1, except replace “embankment” with “subgrade”.

Construct shoulder-only areas, sidewalk, and shared use path areas meeting the requirements of 120-8.1 except replace “embankment” with “subgrade” and meet the acceptance criteria of 160-4.2.

Isolated mixing operations will be considered as separate LOTs. Curb pads and shoulders compacted separately shall be considered separate LOTs. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

160-3.2 Application and Acceptance of Stabilizing Material: After completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Before using any Fossil Fuel Combustion Products (FFCPs), submit documentation, at the preconstruction meeting or no later than 30 days prior to delivery of FFCP’s to the project, signed and sealed by the Specialty

Engineer that these materials meet the requirements of 403.7047 F.S. Notify the Engineer of the approximate quantity to be added before spreading. When additive stabilizing materials are required, spread the material uniformly over the area to be stabilized.

160-3.2.1 Sampling and Testing of Local Material before Mixing: When local materials are used for stabilizing, randomly select locations for sampling using a random number generator approved by the Engineer in accordance with the sampling procedure described in
FM 1-T 267. Test at the minimum frequency listed in the table below before mixing. The Engineer may waive these testing requirements if the additive stabilizing material is RAP or RAP blended materials.

The Engineer will reject the material for failing quality control (QC) test results. The Engineer will sample for Verification and Resolution testing at the minimum frequency listed in the table below. The Engineer will perform Verification tests at the minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Resolution
Liquid Limit (LL), Plastic Index (PI), and Organic Content	One per two LOTs	One per eight LOTs	One per eight LOTs

160-3.2.1.1 Verification Comparison Criteria and Resolution Procedures of Stabilizing Materials: If the QC and the City's Verification tests meet the requirements of Section 914 then the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will submit the Resolution sample to the State Materials Office (SMO) or an AASHTO accredited laboratory designated by SMO to perform Resolution testing.

If the Resolution Test results meet the requirements of Section 914 then the Engineer will accept the LOTs in question. Otherwise remove the material and apply new material meeting the requirements of Section 914 and retest in accordance with 160-3.2.

160-3.3 Mixing: Perform mixing using rotary tillers, a plant or other equipment meeting the approval of the Engineer. The subgrade may be mixed in one course if the equipment and method of construction provides the uniformity, particle size limitation, compaction and other desired results of 160-4. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

Perform the mixing operations, as specified, (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

160-3.4 Mixed Material Requirements: At the completion of the mixing, ensure the following requirements are met:

Criteria	Test Method
Average Organic Content ≤ 2.5%	FM 1-T267
Individual Organic Content Result ≤ 4.0%	FM 1-T267
Liquid Limit ≤ 30	AASHTO T89

Plastic Index ≤ 8	AASHTO T90
Asphalt Content ≤ 4.0%	FM 5-563 (excluding Gradation Analysis)

Ensure the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3 1/2 inch sieve. Break down or remove from the stabilized area materials, including clay lumps or lumps made of clay-size particles (any particle size 2 microns or less), not meeting the gradation requirements. Remove any lumps of clay or clay-sized particles greater than one inch that do not meet the requirements of 160-3.2. Remove any materials not meeting the requirements of this Section from the stabilized area.

160-3.4.1 Bearing Value: Meet the bearing value requirements for the subgrade in accordance with 160-4.

160-3.4.2 Compaction: After completing the mixing operations and satisfying the requirements for bearing value, uniformity, and particle size. Compact the materials at a moisture content permitting the specified compaction in 160-4.2.3. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

160-3.4.3 Finish Grading: Shape the completed stabilized subgrade to conform with the finished lines, grades, and cross-section indicated in the Plans. Check the subgrade using elevation stakes or other means approved by the Engineer.

160-3.4.4 Condition of Completed Subgrade: After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Plans.

Remove all soft and yielding material, and any other portions of the subgrade which will not compact readily, and replace it with suitable material so that the whole subgrade is brought to line and grade, with proper allowance for subsequent compaction.

160-3.4.5 Maintenance of Completed Subgrade: After completing the subgrade as specified above, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, tools, etc. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the City. Construct and maintain ditches and drains along the completed subgrade section.

160-4 Acceptance Program for Mixed Materials.

160-4.1 General Requirements: Meet the requirements of 120-10, except use 160-4.2 instead of 120-10.2, 160-4.3 instead of 120-10.3, and 160-4.4 instead of 120-10.4.

160-4.2 Acceptance Criteria:

160-4.2.1 Bearing Value Requirements:

160-4.2.1.1 General: Within the entire limits of the width and depth of the areas to be stabilized, obtain the required minimum bearing value for each LOT. For any area where the bearing value obtained is deficient from the value indicated in the Plans, in excess of the tolerances established herein, spread and mix additional stabilizing material in accordance with 160-3.3. Perform this reprocessing for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

160-4.2.1.2 Under-tolerances in Bearing Value Requirements: The under-tolerances are allowed for the following specified Bearing Values:

Specified Bearing Value	Under-tolerance
LBR 40	5.0
LBR 35	4.0
LBR 30 (and under)	2.5

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	Unsoaked Bearing Value Required	Under-tolerance
LBR 40	LBR 43	0.0

160-4.2.2 Mixing Depth Requirements: Do not exceed individual plan depth thickness by more than 2 inches or exceed LOT-average depth thickness by more than 1 inch measured to the nearest 0.25 inch. No undertolerance of mixing depth is allowed.

As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may waive the mixing operations (and the work of stabilizing), and the City will not pay for stabilization for such sections of the roadway.

160-4.2.3 Density Requirements:

160-4.2.3.1 General: Within the entire limits of the width and depth of the areas to be stabilized, other than as provided in 160-4.2.3.2, obtain a minimum density at any location of 98% of the Modified Proctor maximum density as determined by FM 1-T 180, Method D.

160-4.2.3.2 Exceptions to Density Requirements: The Contractor need not obtain the minimum density specified in 160-4.2.3.1 if within the following limits:

1. The width and depth of areas which are to be subsequently incorporated into a base course under the same contract.
2. The upper 6 inches of areas to be grassed under the same contract. Compact these areas to a reasonably firm condition as directed by the Engineer.

160-4.2.4 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification for Shoulder-Only, Shared Use Path and Sidewalk Construction
Modified Proctor Maximum Density	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs
Density	One per LOT	One per four LOTs	One per two LOTs
Stabilizing Mixing Depth	Three per 500 feet	Witness one per LOT	Witness one per LOT
LBR	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs

160-4.2.4.1 Local Materials: When local materials are tested in accordance with 160-3.2.1 and meet the requirements of 160-2.2, the Engineer will sample and test at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification for Shoulder-Only, Shared Use Path and Sidewalk Construction
Organic Content, Gradation, LL/PI, and Soil Classification	Not required	One per eight consecutive LOTs	One per four LOTs

160-4.2.4.2 RAP or RAP Blended Materials: When RAP or RAP blended materials are used for stabilizing that are not tested in accordance with 160-3.2.1, conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will sample and test at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification for Shoulder-Only, Shared Use Path and Sidewalk Construction
Asphalt Content, Gradation, LL/PI, and Soil Classification	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs

160-4.3 Additional Requirements:

160-4.3.1 Quality Control Testing:

160-4.3.1.1 Bearing Values: Test the stabilized subgrade sample collected in 160-4.3.1.3. Determine the LBR in accordance with FM 5-515 and 160-4.2.4.

160-4.3.1.1.1 Unsoaked LBR: If unsoaked LBR is desired, submit request for approval to the Engineer. Upon approval by the Engineer to consider the use of unsoaked LBR, randomly sample and test from three locations in the initial Lot for both soaked and unsoaked LBR in accordance with FM 5-515. Ensure all of the tests demonstrate the material achieves the LBR values in 160-4.2.1.2. Continue testing unsoaked LBR at the frequency shown in 160-4.2.4. Discontinue unsoaked LBR testing if any unsatisfactory QC LBR test result is obtained or resolution determines an unsatisfactory LBR.

160-4.3.1.2 Mixing Depths: Meet required plan mixing-depths by measuring from the proposed final grade line. Determine test locations, including stations and offsets, using the Random Number generator approved by the City. Notify the Engineer a minimum of 24 hours before checking mixing depths. Record results on forms supplied by the City.

160-4.3.1.3 Modified Proctor Maximum Density Requirement: Collect enough material to split and create three separate samples. Determine test locations, including stations and offsets, using the Random Number generator approved by the City for the

two LOTs under consideration. Retain the Verification and Resolution samples for the City until the Engineer accepts the LOTs represented by the samples.

160-4.3.1.4 Asphalt Content and Soil Classification: Where RAP or RAP Blended material has been approved for stabilizing, collect enough material to split and create three separate samples. Determine test locations, including stations and offsets, using the Random Number generator approved by the City for the two LOTs under consideration. Retain the Verification and Resolution samples for the City until the Engineer accepts the LOTs represented by the samples. Test the sample in accordance with FM 5-563 (excluding gradation analysis), AASHTO T88, AASHTO T89, AASHTO T90 and AASHTO M145. Determine compliance with the requirements of 160-3.4 and embankment utilization requirements.

160-4.3.2 City Verification Tests:

160-4.3.2.1 Bearing Value & Soil Classification: The Engineer will collect a sample at a location other than the location where the sample was collected in 160-4.3.1.3, and test the stabilized subgrade for determination of the LBR in accordance with FM 5-515. The Engineer will select test locations, including stations and offsets, using a Random Number generator, based on the LOTs under consideration.

If local material is used for stabilizing, and tested in accordance with 160-2.2 and 160.3.2, the Engineer will independently verify compliance with embankment utilization requirements and 160-3.4 by testing and classifying the stabilized subgrade in accordance with AASHTO T88 and AASHTO M 145 at the frequency shown in 160-4.2.4.

When RAP or RAP Blended Material is used, the Engineer will randomly select one of the retained split samples from 160-4.3.1.4 and test in accordance with FM 5-563 (excluding gradation analysis), AASHTO T88, AASHTO T89, AASHTO T90 and AASHTO M145 at the frequency shown in 160-4.2.4.

160-4.3.2.1.1 Unsoaked LBR: The Engineer will sample and test the initial LOT for one soaked and one unsoaked LBR if consideration of the unsoaked LBR has been approved.

160-4.3.2.2 Mixing Depth: The Engineer will witness the Contractor's mixing depth checks to ensure compliance with 160-4.2.2. The Engineer will select test locations, including stations and offsets, using a Random Number generator.

160-4.3.2.3 Modified Proctor Maximum Density: The Engineer will randomly select one of the retained split samples and test in accordance with FM 1-T 180, Method D.

160-4.4 Verification Comparison Criteria and Resolution Procedures:

160-4.4.1 Bearing Value & Soil Classification: If the City's Verification test meets the requirements of 160-4.2.1 and embankment utilization requirements, the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will collect an additional sample in the same LOT the Verification sample was obtained. SMO or an AASHTO accredited laboratory designated by SMO will perform Resolution testing on the additional sample. The material will be sampled and tested in accordance with FM 5-515. If local material is used for stabilization, the sample will be tested in accordance with AASHTO T-88, and AASHTO M-145.

If the Resolution Testing results meet the requirements of 160-4.2.1 and embankment utilization requirements then the Engineer will accept the LOTs in question. Otherwise reprocess the corresponding LOTs in accordance with 160-3 and retest in accordance with 160-4.3.1.1.

If RAP or RAP Blended material is approved for use in the subgrade and the City's Verification tests meet the requirements of 160-3.4 and embankment utilization requirements, the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will test the split sample collected in 160-4.3.1.4. The material will be tested in accordance with FM 5-563 (excluding gradation analysis), AASHTO T88, AASHTO T89, AASHTO T90, and AASHTO M145. If the Resolution Testing results meet the requirements of 160-3.4 and embankment utilization requirements, then the Engineer will accept the LOTs in question. Otherwise, reprocess the corresponding LOTs in accordance with 160-3 and retest in accordance with 160-4.

160-4.4.2 Mixing Depth Thickness: The City will witness the mixing

1. If the depth checks meet the requirements of 160-4.2.2 the Engineer will accept that 500-foot section.

2. If the depth checks confirm shallow depth, re-mix the 500-foot section to an appropriate depth and re-measure in accordance with 160-4.3.1.2. The Engineer will repeat the witness process.

3. If the depth checks confirm extra deep mixing, conduct an additional QC density test after compaction for the bottom 12 inches of the subgrade for that 500-foot section in addition to a QC density test for the top 12 inches. The additional density test must meet the requirements of 160-4.2.3.

160-4.4.3 Modified Proctor Maximum Density Determination: The Engineer will compare the Verification test results of 160-4.3.2.3 to the corresponding QC test results. If the test result is within 4.5 lb/ft^3 of the QC test result, the LOTs will be verified. Otherwise, the Engineer will collect the Resolution split sample corresponding to the Verification sample tested. SMO or an AASHTO accredited laboratory designated by SMO will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T 180, Method D.

The Engineer will compare the Resolution Test results with the QC test results. If the Resolution Test result is within 4.5 lb/ft^3 of the corresponding QC test result, the Engineer will use the QC test results for material acceptance purposes for each corresponding pair of LOTs. If the Resolution test result is not within 4.5 lb/ft^3 of the corresponding QC test, the Engineer will collect the remaining Verification split samples for testing. Verification Test results will be used for material acceptance purposes for the LOTs in question**.**

160-4.4.4 Density: When a Verification or Independent Verification density test does not meet 160-4.2.3 (Acceptance Criteria), retest at a site within a 5 feet radius of the Verification test location and observe the following:

1. If the QC retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the LOTs in question.

2. If the QC retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, rework and retest the material in that LOT. The Engineer will re-verify the LOTs in question.

3. If the QC retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment-comparison analysis as defined in 120-10.1.2. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

160-5 Method of Measurement.

The quantity to be paid for will be the plan quantity, in square yards, completed and accepted.

160-6 Basis of Payment.

Price and payment will constitute full compensation for all work and materials specified in this Section, including furnishing, spreading and mixing of all stabilizing material required and any reprocessing of stabilization areas necessary to attain the specified bearing value. The City will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources within the limits of the stabilizing.

If the item of borrow excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for borrow excavation.

Payment will be made under:

Item No. 160- 4- Stabilization - per square yard.

SECTION 162 - PREPARED SOIL LAYER

162-1 Description.

162-1.1 Finish Soil Layer: Unless otherwise called for in the Plans, prepare a 6 inch thick layer of existing soil mixed with imported material, if necessary, to achieve the pH and organic matter levels required in Section 987, that is favorable to turf and ground cover growth over areas of the project which are to be seeded, seeded and mulched, or planted, by mixing in an organic material, compost, or commercially available soil amendments. Prepare finish soil layer in areas to be sodded, when called for in the Plans.

162-1.2 Organic Soil Layer: When required by a permit, prepare a 6 inch thick layer of organic soil, at locations shown in the Plans.

162-1.3 Blanket Material: When required by a permit, place a layer of blanket material at the locations and to the depth shown in the Plans.

162-2 Materials.

162-2.1 Finish Soil Layer and Organic Soil Layer: Meet the requirements of Section 987.

162-2.2 Blanket Material: Meet the material classification shown in the Plans and Design Standards, Index No. 505.

162-3 Ownership of Surplus Materials.

The Department will retain ownership of all materials suitable for construction of the prepared soil layer until the final job requirements have been fulfilled. Unless otherwise shown in the Contract Documents, upon final acceptance, Contractor shall take ownership of any surplus materials and dispose of in accordance with 120-5.

Where temporary storage of apparent surplus materials within the right-of-way may be impractical, the materials may be stockpiled outside the right-of-way in areas provided by the Contractor until needed on the project or declared surplus. With the Engineer's written approval,
the Contractor may dispose of excess material with the stipulation that any portion required to fulfill job requirements will be replaced with equally suitable material at no cost to the Department.

No extra compensation is allowed for any rehandling involved under the provisions of this Subarticle.

162-4 Construction Methods.

Construct the surface of the earthwork to such lines and elevations that will provide a surface conforming to the plan lines and elevations upon completion of the prepared soil operations. Leave the surface of the earthwork in a roughened and loose condition. Prevent contamination of the materials by other construction operations. Remove and replace all materials which fail to meet the required soil classification or become contaminated after placement, and correct any slippage of this material at no cost to the Department. Spread the appropriate material uniformly over areas to receive treatment.

162-4.1 Finish Soil Layer: After spreading, mix the material with the underlying soil to a combined depth of 6 inches, unless otherwise called for in the Plans. Continue mixing to provide a uniform finish soil layer true to line and grade.

162-4.2 Organic Soil Layer: Spread materials to the depth of 6 inches.

162-4.3 Blanket Material: Place the blanket material to the depth shown in the plans.

162-5 Acceptance Testing.

The Engineer reserves the right to waive or reduce testing requirements for shoulder treatment projects as defined in the Design Standards, Index No. 105.

Immediately after completion of construction operations, sample and test the prepared soil layer at a testing laboratory qualified under 105-6. A LOT is defined as 0.5 shoulder miles. Take random quality control (QC) samples at a minimum of one sample per LOT of prepared surface. When the source of added material changes, the Engineer will require an additional sample. Average four sequential LOTs representing 2.0 shoulder miles to determine compliance with Section 987. Raise the organic matter content of any individual LOT with an organic matter content below 1.5% to at least 1.5%. The Engineer will take a Verification sample at a minimum frequency of one sample per 4 LOTs. If the Verification sample fails (below 1.5% for organics), but the QC sample taken in the corresponding LOT passes, the Engineer will obtain a resolution sample within the same LOT to resolve the non comparison. The Engineer reserves the right to take and test additional samples to determine specification compliance. For failing samples, take and test additional samples, as directed by the Engineer, to delineate areas that need re-treatment. Perform re-treatment at no additional cost to the Department. Perform additional testing of retreated areas, at locations directed by the Engineer, to determine specification compliance. Submit all test results to the Engineer.

162-5.1 Finish Soil Layer: Test sampled material for organic matter content, pH, primary macronutrients (N, P K) and secondary macronutrients (S, Ca, Mg) content. Acquire from the soil testing laboratory fertilizer recommendations for the specific plants to be grown in the area. Do not seed, seed and mulch, or place sod until acceptable values for organic content and pH are obtained in accordance with the requirements of 987-1.

162-5.2 Organic Soil Layer: Test sampled material for organic matter content in accordance with the requirements of 987-1.

162-5.3 Blanket Material: Test blanket material for depth in accordance with the Plans and for soil classification in accordance with AASHTO M145. Add materials as necessary to achieve the required depth.

162-6 Method of Measurement.

The quantities to be paid for will be the plan quantity for the following items meeting the requirements of this Section, completed and accepted:

1. The area, in square yards, of finish soil layer.
2. The area, in square yards, of organic soil layer.
3. The area, in square yards, of blanket material.

162-7 Basis of Payment.

Prices and payments will be full compensation for completing all work specified in this Section, including furnishing, hauling, and placing materials to the lines and grades shown in the Plans.

Payment will be made under:

Item No. 162- 1- Prepared Soil Layer - per square yard.

SECTION 334 SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Superpave Asphalt Concrete pavement with the type of mixture specified in the Contract Documents, or when offered as alternates, as selected. Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Obtain Superpave Asphalt Concrete from a plant that is currently on the City's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. Producers must meet the requirements of Section 320 for plant and equipment and the general construction requirements of Section 330.

334-1.2 Traffic Levels: The requirements for Type SP Asphalt Concrete mixtures are based on the design traffic level of the project, expressed in 18,000 pound Equivalent Single Axle Loads (ESAL's). The five traffic levels are as shown in Table 334-1.

Table 334-1
Superpave Traffic Levels

Traffic Level	Traffic Level ($1x10^6$ ESAL's)
A	<0.3
B	0.3 to <3
C	3 to <10
D	10 to <30
E	≥30

The traffic levels for the project are as specified in the Contract Documents. A Type SP mix one traffic level higher than the traffic level specified in the Contract Documents may be substituted, at no cost to the City (i.e., Traffic Level B may be substituted for Traffic Level A, etc.).

334-1.3 Gradation Classification: The Superpave mixes are classified as fine and are defined in 334-3.2.2.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

Type SP-9.5..... 9.5 mm
Type SP-12.5..... 12.5 mm
Type SP-19.0..... 19.0 mm

334-1.4 Thickness: The total thickness of the Type SP asphalt layers will be the plan thickness as shown in the Contract Documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

$$\text{Spread rate (lbs/yd}^2) = t \times G_{mm} \times 43.3$$

Where: t = Thickness (in.) (plan thickness or individual layer thickness)

G_{mm} = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.

Note: Plan quantities are based on a G_{mm} of 2.540, corresponding to a spread rate of 110 lbs/yd^2-in. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

334-1.4.1 Layer Thicknesses: The allowable layer thicknesses for Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5.....1 to 1-1/2 inches
Type SP-12.5..... 1-1/2 to 2-1/2 inches
Type SP-19.0..... 2 to 4 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.

Type SP-9.5 – May not be used on Traffic Level D and E applications.

Type SP-19.0 - May not be used in the final (top) structural layer below FC-5 mixtures. Type SP-19.0 mixtures are permissible in the layer directly below FC-9.5 and FC-12.5 mixtures.

334-1.4.2 Additional Requirements: The following requirements also apply to Type SP Asphalt Concrete mixtures:

1. A minimum 1-1/2 inch initial lift is required over an Asphalt Rubber Membrane Interlayer (ARMI).

2. When construction includes the paving of adjacent shoulders (less than or equal to 5 feet wide), the layer thickness for the upper pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract Documents.

3. All overbuild layers must be Type SP Asphalt Concrete designed at the traffic level as stated in the Contract Documents. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract Documents. On variable thickness overbuild layers, the minimum and maximum allowable thicknesses will be as specified below, unless called for differently in the Contract Documents.

Type SP-9.5..... 3/8 to 2 inches
Type SP-12.5..... 1/2 to 3 inches
Type SP-19.0.....1-1/2 to 4 inches

4. Variable thickness overbuild layers constructed using a Type SP-9.5 or SP-12.5 mixtures may be tapered to zero thickness provided the contract documents require a minimum of 1-1/2 inches of dense-graded mix placed over the variable thickness overbuild layer.

334-2 Materials.

334-2.1 General Requirements: Meet the material requirements specified in Division III. Specific references are as follows:

Superpave PG Asphalt Binder .....Section 916
Coarse Aggregate.....Section 901
Fine Aggregate.....Section 902

334-2.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract Documents, use a PG 67-22 asphalt binder. In addition, meet the requirements of 334-2.3.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture subject to the following requirements:

1. When using a PG 76-22 (PMA), or PG 76-22 (ARB), or PG 82-22 (PMA) asphalt binder, limit the amount of RAP material used in the mix to a maximum of 20% by weight of total aggregate. As an exception, amounts greater than 20% RAP by weight of total aggregate can be used if no more than 20% by weight of the total asphalt binder comes from the RAP material.

2. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

3. Use RAP from a City approved stockpile or millings from a City project.

4. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

5. Provide RAP material having a minimum average asphalt binder content of 4.0% by weight of RAP. As an exception, when using fractionated RAP, the minimum average asphalt binder content for the coarse portion of the RAP shall be 2.5% by weight of the coarse portion of the RAP. The coarse portion of the RAP shall be the portion of the RAP retained on the No. 4 sieve. The Engineer may sample the stockpiles to verify that this requirement is met.

334-2.3.2 Material Characterization for Mix Design: Assume responsibility for establishing the asphalt binder content, gradation, and bulk specific gravity (G_{sb}) of the RAP material based on a representative sampling of the material by roadway cores or stockpile samples. For roadway core samples, assume responsibility for the degradation that will occur during the milling operation.

334-2.3.3 RAP Stockpile Approval: Prior to the incorporation of RAP into the asphalt mixture, stockpile the RAP material and obtain approval for the stockpile by one of the following methods:

1. Continuous stockpile: When RAP is obtained from one or multiple sources and is either processed, blended, or fractionated, and stockpiled in a continuous manner, assure an adequate number of test results are obtained for stockpile approval. Test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. In addition, address the details and specifics of the processing, sampling, testing and actions to be taken in the Producer Quality Control (QC) Plan.

2. Non-continuous single stockpile: When an individual stockpile is being constructed, obtain representative samples at random locations and test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the

stockpiled material. Once the RAP stockpile has been approved, do not add additional material without prior approval of the Engineer.

Determine the asphalt binder content and gradation of the RAP material in accordance with FM 5-563 and FM 1-T 030, respectively. Establish the G_{sb} of the RAP material by using one of the following methods:

a. Calculate the G_{sb} value based upon the effective specific gravity (G_{se}) of the RAP material, determined on the basis of the asphalt binder content and maximum specific gravity (G_{mm}) of the RAP material. The Engineer will approve the estimated asphalt binder absorption value used in the calculation.

b. Measure the G_{sb} of the RAP aggregate, in accordance with FM 1-T 084 and FM 1-T 085. Obtain the aggregate by using a solvent extraction method.

334-2.3.4 Pavement Coring Report: When the Contract includes milling of the existing asphalt pavement, the Pavement Coring Report may be available on the City's website.

334-2.3.5 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334-2. Obtain a sample of the mixture for the Engineer within the first 1,000 tons of production and at a continuing frequency of one sample per 4,000 tons of mix. The Engineer reserves the right to change the asphalt binder grade at design based on the characteristics of the RAP asphalt binder, and reserves the right to make changes during production.

Table 334-2
Asphalt Binder Grade for Mixes Containing RAP

Percent RAP	Asphalt Binder Grade
0 - 15	PG 67-22
16 - 30	PG 58-22
>30	PG 52-28

334-2.4 Recycled Crushed Glass: Recycled crushed glass may be used as a component of the asphalt mixture subject to the following requirements:

1. Consider the recycled crushed glass a local material and meet all requirements specified in 902-6.

2. Limit the amount of recycled crushed glass to a maximum of 15% by weight of total aggregate.

3. Use an asphalt binder that contains a minimum of 0.5% anti-stripping agent by weight of binder. The anti-strip additive shall be one of the products listed on the Approved Product List (APL). The anti-strip additive shall be introduced into the asphalt binder by the supplier during loading.

4. Do not use recycled crushed glass in friction course mixtures or in structural course mixtures which are to be used as the final wearing surface.

334-3 General Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R 35-12, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For Traffic Level B through E mix designs, include representative samples of all component materials, including asphalt binder. Allow the State Materials Engineer a maximum of four weeks to either conditionally verify or reject the mix as designed.

Do not use more than four mix designs per nominal maximum aggregate size per traffic level per binder grade per year, where the year starts at the Notice to Proceed. Exceeding this limitation will result in a maximum Composite Pay Factor (CPF) of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

Warm mix technologies (additives, foaming techniques, etc.) listed on the Florida Department of Transportation website may be used in the production of the mix. The URL for obtaining this information, if available, is: http://www.dot.state.fl.us/statematerialsoffice/quality/programs/warmmixasphalt/index.shtm .

The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of the mix design.

334-3.2.2 Mixture Gradation Requirements: Combine the coarse and fine aggregate in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M 323-12, Table 3. Aggregates from various sources may be combined.

334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M 323-12, Table-3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M 323-12, Table 4. Fine mixes are defined as having a gradation that passes above the primary control sieve control point and above the maximum density line for all sieve sizes smaller than the primary control sieve and larger than the No. 100 sieve.

334-3.2.3 Aggregate Consensus Properties: For Traffic Level C through E mixtures, meet the following consensus properties at design for the aggregate blend. Aggregate consensus properties do not apply to Traffic Level A and B mixtures.

334-3.2.3.1 Coarse Aggregate Angularity: When tested in accordance with ASTM D 5821-01 (2006), meet the percentage of fractured faces requirements specified in AASHTO M 323-12, Table 5.

334-3.2.3.2 Fine Aggregate Angularity: When tested in accordance with AASHTO T 304-11, Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M 323-12, Table 5.

334-3.2.3.3 Flat and Elongated Particles: When tested in accordance with ASTM D 4791-10, (with the exception that the material passing the 3/8 inch sieve and retained on the No. 4 sieve shall be included), meet the requirements specified in AASHTO M 323-12, Table 5. Measure the aggregate using the ratio of 5:1, comparing the length (longest dimension) to the thickness (shortest dimension) of the aggregate particles.

334-3.2.3.4 Sand Equivalent: When tested in accordance with AASHTO T 176-08, meet the sand equivalent requirements specified in AASHTO M 323-12, Table 5.

334-3.2.4 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T 312-12, with the following exception: use the number of gyrations at N_{design} as defined in Table 334-3. Measure the inside diameter of gyratory molds in accordance with AASHTO T 312-12.

Table 334-3 Gyratory Compaction Requirements	
Traffic Level	N_{design} Number of Gyrations
A	50
B	65
C	75
D	100
E	100

334-3.2.5 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M 323-12, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M 323-12, Table 6. $N_{initial}$ and $N_{maximum}$ requirements are not applicable.

334-3.2.6 Moisture Susceptibility:

1. For Traffic Level A and B mixtures, use a liquid anti-strip additive, at a rate of 0.5% by weight of the asphalt binder. The anti-strip additive must be listed on the APL. Other rates of anti-strip additive may be used upon approval of the Engineer.

2. For Traffic Level C through E mixtures, test 4 inch specimens in accordance with FM 1-T 283. Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi. If necessary, add a liquid anti-stripping agent and/or hydrated lime (meeting the requirements of Section 337) in order to meet these criteria. The anti-strip additive must be listed on the APL.

334-3.2.7 Additional Information: In addition to the requirements listed above, provide the following information with each proposed mix design submitted for verification:

1. The design traffic level and the design number of gyrations (N_{design}).

2. The source and description of the materials to be used.

3. The City source number and the City product code of the aggregate components furnished from a City approved source.

4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.

5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.

6. The bulk specific gravity (G_{sb}) value for each individual aggregate and RAP component, as identified in the City's aggregate control program.

7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.

8. A target temperature for the mixture at the plant (mixing temperature) and a target temperature for the mixture at the roadway (compaction temperature) in accordance with 320-6.3. Do not exceed a target temperature of 340°F for PG 82-22 (PMA) asphalt binders,

330°F for PG 76-22 (PMA) and PG 76-22 (ARB) asphalt binders, and 315°F for unmodified asphalt binders.

9. Provide the physical properties achieved at four different asphalt binder contents. One of which must be at the optimum asphalt content, and must conform to all specified physical requirements.

10. The name of the Construction Training Qualification Program (CTQP) Qualified Mix Designer.

11. The ignition oven calibration factor.

12. The warm mix technology, if used.

334-3.3 Mix Design Revisions: During production, the Contractor may request a target value revision to a mix design, subject to meeting the following requirements: the target change falls within the limits defined in Table 334-4, appropriate data exists demonstrating that the mix complies with production air voids specification criteria, and the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.

Table 334-4
Limits for Potential Adjustments to Mix Design Target Values

Characteristic	Limit from Original Mix Design
No. 8 sieve and Coarser	± 5.0%
No. 16 sieve	± 4.0%
No. 30 sieve	± 4.0%
No. 50 sieve	± 3.0%
No. 100 sieve	± 3.0%
No. 200 sieve	± 1.0%
Asphalt Binder Content (1)	± 0.3%
Each Component of Aggregate Blend (2)	± 5.0 %

(1) Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0% below the design criteria.
(2) Revisions to FC-5 mixtures to be determined by the Engineer.

Submit all requests for revisions to mix designs, along with supporting documentation, to the Engineer. In order to expedite the revision process, the request for revision or discussions on the possibility of a revision may be made verbally, but must be followed up by a written request. The verified mix design will remain in effect until the Engineer authorizes a
change. In no case will the effective date of the revision be established earlier than the date of the first communication between the Contractor and the Engineer regarding the revision.

A new design mix will be required if aggregate sources change, or for any substitution of an aggregate product with a different aggregate code, unless approved by the Engineer.

334-4 Producer Process Control (PC).

Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for process control purposes. Enter all PC test data into the City's database. The Engineer will not use these test results in the acceptance payment decision.

Address in the Producer QC Plan how PC failures will be handled. When a PC failure occurs, investigate, at a minimum, the production process, testing equipment and/or sampling

methods to determine the cause of the failure, and make any necessary changes to assure compliance with these Specifications. Obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up PC sample also fails to meet Specification requirements, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the QC Manager.

334-5 Acceptance of the Mixture.

334-5.1 General: The mixture will be accepted at the plant with respect to gradation (P_{-8} and P_{-200}), asphalt content (P_b), and volumetrics (volumetrics is defined as air voids at N_{design}). The mixture will be accepted on the roadway with respect to density of roadway cores. Acceptance will be on a LOT by LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. Acceptance of the mixture will be based on Contractor QC test results that have been verified by the City.

334-5.1.1 Sampling and Testing Requirements: Obtain the samples in accordance with FM 1-T 168. Obtain samples at the plant of a sufficient quantity to be split into three smaller samples; one for QC, one for Verification testing and one for Resolution testing; each sample at approximately 35 pounds. The split samples for Verification testing and Resolution testing shall be reduced in size and stored in three boxes each. The approximate size of each box must be 12 inches x 8 inches x 4 inches. Provide, label and safely store sample boxes in a manner agreed upon by the Engineer for future testing.

The asphalt content of the mixture will be determined in accordance with FM 5-563. The gradation of the recovered aggregate will be determined in accordance with FM 1-T 030. Volumetric testing will be in accordance with AASHTO T 312-12and FM 1-T 209. Prior to testing volumetric samples, condition the test-sized sample for one hour, plus or minus five minutes, at the target roadway compaction temperature in a shallow, flat pan, such that the mixture temperature at the end of the one hour conditioning period is within plus or minus 20°F of the roadway compaction temperature. Test for roadway density in accordance with FM 1-T 166.

334-5.1.2 Acceptance Testing Exceptions: When the total combined quantity of hot mix asphalt for the project, as indicated in the Plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection. The Engineer may require the Contractor to run process control tests for informational purposes, as defined in 334-4, or may run independent verification tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, open-graded friction courses, variable thickness overbuild courses, leveling courses, any asphalt layer placed on subgrade (regardless of type), miscellaneous asphalt pavement, shared use paths, crossovers, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. Density testing for acceptance will not be performed on asphalt courses placed on bridge decks or approach slabs; compact these courses in static mode only per the requirements of 330-7.7. In addition, density testing for acceptance will not be performed on the following areas when they are less than 1,000 feet (continuous) in length: turning lanes, acceleration lanes, deceleration lanes, shoulders, parallel parking lanes or ramps. Do not perform density testing foracceptance in situations where the areas requiring density testing is less than 50 tons within a sublot.

Density testing for acceptance will not be performed in intersections. The limits of the intersection will be from stop bar to stop bar for both the mainline and side streets. A random core location that occurs within the intersection shall be moved forward or backward from the intersection at the direction of the Engineer.

Where density testing for acceptance is not required, compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) as approved by the Engineer or with Standard Rolling Procedure as specified in 330-7.2. In the event that the rolling procedure deviates from the procedure approved by the Engineer, or the Standard Rolling Procedure, placement of the mix shall be stopped.

The density pay factor (as defined in 334-8.2) for areas not requiring density testing for acceptance will be paid at the same density pay factor as for the areas requiring density testing within the same LOT. If the entire LOT does not require density testing for acceptance, the LOT will be paid at a density pay factor of 1.00.

334-5.2 Full LOTs: Each LOT will be defined (as selected by the Contractor prior to the start of the LOT) as either (1) 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each, or (2) 4,000 tons, with each LOT subdivided into four equal sublots of 1,000 tons each. As an exception to this, the initial LOT of all new mix designs shall be defined as 2,000 tons, subdivided into four equal sublots of 500 tons each. Before the beginning of a LOT, the Engineer will develop a random sampling plan for each sublot and direct the Contractor on sample points, based on tonnage, for each sublot during construction.

334-5.3 Partial LOTs: A partial LOT is defined as a LOT size that is less than a full LOT. A partial LOT may occur due to the following:

l. The completion of a given mix type or mix design on a project.

2. Closure of the LOT due to time. LOTs will be closed 30 calendar days after the start of the LOT. Time periods other than 30 calendar days may be used if agreed to by both the Engineer and the Contractor, but under no circumstances shall the LOT be left open longer than 60 days.

3. A LOT is terminated per 334-5.4.4.

All partial LOTs will be evaluated based on the number of tests available, and will not be redefined. If a LOT is closed before the first plant random sample is obtained, then the LOT will be visually accepted by the Engineer and the LOT pay factor will be 1.00.

334-5.4 QC Sampling and Testing: Obtain all samples randomly as directed by the Engineer.

Should the Engineer determine that the QC requirements are not being met or that unsatisfactory results are being obtained, or should any instances of falsification of test data occur, acceptance of the Producer's QC Plan will be suspended and production will be stopped.

334-5.4.1 Lost or Missing Verification/Resolution Samples: In the event that any of the Verification and/or Resolution samples that are in the custody of the Contractor are lost, damaged, destroyed, or are otherwise unavailable for testing, the minimum possible pay factor for each quality characteristic as described in 334-8.2 will be applied to the entire LOT in question, unless called for otherwise by the Engineer. Specifically, if the LOT in question has more than two sublots, the pay factor for each quality characteristic will be 0.55. If the LOT has two or less sublots, the pay factor for each quality characteristic will be 0.80. In either event, the material in question will also be evaluated in accordance with 334-5.9.5.

If any of the Verification and/or Resolution samples that are in the custody of the City are lost, damaged, destroyed or are otherwise unavailable for testing, the

corresponding QC test result will be considered verified, and payment will be based upon the Contractor's data.

334-5.4.2 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1 as directed by the Engineer. Test the QC split sample for gradation, asphalt binder content and volumetrics in accordance with 334-5.1.1. Complete all QC testing within one working day from the time the samples were obtained.

334-5.4.3 Roadway Sampling and Testing Requirements: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these QC samples for density (G_{mb}) in accordance with 334-5.1.1. Obtain a minimum of three cores per sublot at random locations as identified by the Engineer in situations where the sublot/LOT was closed or terminated before the random numbers were reached or where it is impractical to cut five cores per sublot. Do not obtain cores any closer than 12 inches from an unsupported edge. The Engineer may adjust randomly generated core locations for safety purposes or as the Engineer deems necessary. Maintain traffic during the coring operation; core the roadway, patch the core holes (within three days of coring); and trim the cores to the proper thickness prior to density testing.

Density for the sublot shall be based on the average value for the cores cut from the sublot with the target density being the maximum specific gravity (G_{mm}) of the sublot. Once the average density of a sublot has been determined, do not retest the samples unless approved by the Engineer. Ensure proper handling and storage of all cores until the LOT in question has been accepted.

334-5.4.4 Individual Test Tolerances for QC Testing: Terminate the LOT if any of the following QC failures occur:

1. An individual test result of a sublot for air voids does not meet the requirements of Table 334-5,
2. The average sublot density does not meet the requirements of Table 334-5,
3. Two consecutive test results within the same LOT for gradation or asphalt binder content do not meet the requirements of Table 334-5,

When a LOT is terminated due to a QC failure, stop production of the mixture until the problem is resolved to the satisfaction of the QC Manager and/or Asphalt Plant Level II technician responsible for the decision to resume production after a QC failure, as identified in Section 105. In the event that it can be demonstrated that the problem can immediately be or already has been resolved, it will not be necessary to stop production. When a LOT is terminated, make all necessary changes to correct the problem. Do not resume production until appropriate corrections have been made. Inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have corrected the problem. Summarize this information and provide it to the Engineer prior to the end of the work shift when production resumes.

In the event that a QC failure is not addressed as defined above, the Engineer's approval will be required prior to resuming production after any future QC failures.

Address any material represented by a failing test result, as defined above in this subarticle, in accordance with 334-5.9.5. Any LOT terminated under this subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for each quality characteristic.

In the event that a G_{mm} test result differs by more than 0.040 from the mix design G_{mm}, investigate the causes of the discrepancy and report the findings and proposed actions to the Engineer.

Table 334-5 Master Production Range	
Characteristic	Tolerance (1)
Asphalt Binder Content (%)	Target ±0.55
Passing No. 200 Sieve (%)	Target ±1.50
Air Voids (%)	2.30 – 6.00
Density (minimum % G_{mm})(2)	89.50
(1) Tolerances for sample size of n = 1 from the verified mix design (2) Based on an average of 5 randomly located cores	

334-5.5 Verification Testing: In order to determine the validity of the Contractor's QC test results prior to their use in the Acceptance decision, the Engineer will run verification tests.

334-5.5.1 Plant Testing: At the completion of each LOT, the Engineer will test a minimum of one Verification split sample randomly selected from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed. Verification samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.

The Verification test results will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-6.

Table 334-6 Between-Laboratory Precision Values	
Property	Maximum Difference
G_{mm}	0.016
G_{mb} (gyratory compacted samples)	0.022
G_{mb} (roadway cores)	0.014
P_b	0.44%
P_{-200}	FM 1-T 030 (Figure 2)
P_{-8}	FM 1-T 030 (Figure 2)

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Contractor's QC test data for the LOT.

If any of the results do not compare favorably, then the Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in 334-5.6.

334-5.5.2 Roadway Testing: At the completion of each LOT, the Engineer will determine the density (G_{mb}) of each core (previously tested by QC) as described in 334-5.1.1 from the same sublot as the plant samples. For situations where roadway density is not required for the random sublot chosen, then another sublot shall be randomly chosen for

roadway density cores only. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed.

The individual Verification test results will be compared with individual QC test results by the Engineer based on the between-laboratory precision values given in Table 334-6.

If each of the core test results compare favorably, then the LOT will be accepted with respect to density, with payment based on the Contractor's QC test data for the LOT.

If any of the results do not compare favorably, then the core samples from the LOT will be sent to the Resolution laboratory for testing as specified in 334-5.6.

334-5.6 Resolution System:

334-5.6.1 Plant Samples: In the event of an unfavorable comparison between the Contractor's QC test results and the Engineer's Verification test results on any of the properties identified in Table 334-6, the Resolution laboratory will test all of the split samples from the LOT for only the property (or properties) in question. Resolution samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 1-
1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during
the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.

334-5.6.2 Roadway Samples: In the event of an unfavorable comparison between the Contractor's QC test data and the Engineer's Verification test data on the density results, the Resolution laboratory will test all of the cores from the LOT. Testing will be as described in 334-5.1.1. Any damaged roadway cores will not be included in the evaluation; replace damaged cores with additional cores at the direction of the Engineer.

334-5.6.3 Resolution Determination: The Resolution test results (for the property or properties in question) will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-6.

If the Resolution test results compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the QC results, and the City will bear the costs associated with Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution test results do not compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the Resolution test data for the LOT, and the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing. In addition, in the event that the application of the Resolution test results in a failure to meet the requirements of Table 334-5, address any material represented by the failing test result in accordance with 334-5.9.5.

In the event of an unfavorable comparison between the Resolution test results and QC test results, make the necessary adjustments to assure that future comparisons are favorable.

334-5.7 Independent Verification (IV) Testing:

334-5.7.1 Plant: The Contractor shall provide sample boxes and take samples as directed by the Engineer for IV testing. Obtain enough material for three complete sets of tests

(two samples for IV testing by the Engineer and one sample for testing by the Contractor). If agreed upon by both the Engineer and the Contractor, only one sample for IV testing by the Engineer may be obtained. IV samples will be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. The Contractor's split sample, if tested immediately after sampling, shall be reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. If the Contractor's sample is not tested immediately after sampling, then the sample shall be reheated at the target roadway compaction temperature for 1-
1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. For the IV and Contractor's samples, in lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1. The Contractor's test results shall be provided to the Engineer within one working day from the time the sample was obtained.

If any of the IV test results do not meet the requirements of Table 334-5, then a comparison of the IV test results and the Contractor's test results, if available, will be made. If a comparison of the IV test results and the Contractor's test results meets the precision values of Table 334-6 for the material properties in question, or if the Contractor's test results are not available, then the IV test results are considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

If a comparison of the IV test results and the Contractor's test results does not meet the precision values of Table 334-6 for the material properties in question, then the second IV sample shall be tested by the Engineer for the material properties in question. If a comparison between the first and second IV test results does not meet the precision values of Table 334-6 for the material properties in question, then the first IV test results are considered unverified for the material properties in question and no action shall be taken.

If a comparison between the first and second IV test results meets the precision values of Table 334-6 for the material properties in question, then the first IV sample is considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.as specified in 334-6.

The Engineer has the option to use the IV sample for comparison testing

334-5.7.2 Roadway: Obtain five 6 inch diameter roadway cores within 24 hours of placement, as directed by the Engineer, for IV testing. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations, as identified by the Engineer. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1. If the average of the results for the sublot does not meet the requirements of Table 334-5 for density, then a comparison of the IV Gmm test results and the Contractor's Gmm test results, if available, will be made in

accordance with the procedure provided in 334-5.7.1. Address any material represented by the failing test results in accordance with 334-5.9.5.

334-5.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-9.

334-5.9 Minimum Acceptable Quality Levels:

334-5.9.1 PFs Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.2 CPFs Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.3 CPFs Less Than 0.80 and Greater Than or Equal to 0.75: If the CPF for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.9.5.

334-5.9.4 CPFs Less Than 0.75: If the CPF for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the City, or as approved by the Engineer.

334-5.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the City.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis in accordance with Section 6 by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a CPF as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure, upon the approval of the Engineer the Contractor may perform delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that may require removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation sampling and testing shall be monitored and verified by the Engineer. For materials that are defective due to air voids, an engineering analysis is required.

When evaluating defective material by engineering analysis or delineation testing, at a minimum, evaluate all material located between passing QC, PC or IV test results. Exceptions to this requirement shall be approved by the Engineer.

334-6 Comparison Testing.

At the start of the project (unless waived by the Engineer) and at other times as determined necessary by the Engineer, provide split samples for comparison testing with the Engineer. The purpose of these tests is to verify that the testing equipment is functioning

properly and that the testing procedures are being performed correctly. In the event that the Engineer determines that there is a problem with the Contractor's testing equipment and/or testing procedures, immediately correct the problem to the Engineer's satisfaction. In the event that the problem is not immediately corrected, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for comparison testing may also be used for the QC sample. The split sample used for comparison testing must also meet the requirements for IV testing described in 334-5.7.

334-7 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections 320 and 330), the quantity to be paid for will be the weight of the mixture, in tons. For each pay item, excluding overbuild, the pay quantity will be based on the quantity placed on the project, limited to 105% of the adjusted plan quantity for the pay item. The adjusted plan quantity will be determined by dividing the pay item's original plan quantity (including any Engineer approved quantity revisions) by the design G_{mm} stated in 334-1.4, then multiplying it by the tonnage-weighted average G_{mm} of the mixes used for the pay item.

The bid price for the asphalt mix will include the cost of the liquid asphalt and the tack coat application as directed in 300-8. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix. For the calculation of unit price adjustments of bituminous material, the average asphalt content will be based on the percentage specified in 9-
2.1.2. The weight will be determined as provided in 320-3.2 (including the provisions for the automatic recordation system).

Prepare a Certification of Quantities, using the City's current approved form, for the certified Superpave asphalt concrete pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the roadway per Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330).

For materials accepted in accordance with 334-5, based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for the following individual quality characteristics: pavement density, air voids, asphalt binder content, and the percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed by multiplying a Composite Pay Factor (CPF) for the LOT by the bid price per ton.

334-8.2 Pay Factors:

334-8.2.1 Partial LOTs: For Partial LOTs where no random sample is obtained due to insufficient tonnage, a CPF of 1.00 shall be applied.

334-8.2.2 Two or Less Sublot Test Results: In the event that two or less sublot test results are available for a LOT, Pay Factors will be determined based on Table 334-7, using the average of the accumulated deviations from the target value. (Deviations are absolute values with no plus or minus signs.) Use the 1-Test column when there is only one sublot test result and use the 2-Tests column when there are two sublots.

Table 334-7 Small Quantity Pay Table		
Pay Factor	1 Sublot Test Deviation	2 Sublot Test Average Deviation
Asphalt Binder Content		
1.05	0.00-0.23	0.00-0.16
1.00	0.24-0.45	0.17-0.32
0.90	0.46-0.55	0.33-0.39
0.80	>0.55	>0.39
No. 8 Sieve		
1.05	0.00-2.25	0.00-1.59
1.00	2.26-4.50	1.60-3.18
0.90	4.51-5.50	3.19-3.89
0.80	>5.50	>3.89
No. 200 Sieve		
1.05	0.00-0.55	0.00-0.39
1.00	0.56-1.10	0.40-0.78
0.90	1.11-1.50	0.79-1.06
0.80	>1.50	>1.06
Air Voids		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.90	1.01-1.70	0.72-1.20
0.80	1.71-2.00	1.21-1.41
0.70	2.01-2.50	1.42-1.77
0.55	>2.50	>1.77
Density (1)		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.95	1.01-2.00	0.72-1.41
0.90	2.01-3.00	1.42-2.12
0.80	>3.00	>2.12

Table 334-7 Small Quantity Pay Table		
Pay Factor	1 Sublot Test Deviation	2 Sublot Test Average Deviation
(1). Each density test result is the average of five cores. The target density is 93.00 percent of G_{mm} (92.00 percent when compaction is limited to the static mode or for layers specified to be one inch thick). When compaction is limited to the static mode, no vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer. In this case, the target density is 92.00 percent of G_{mm}.		

334-8.2.3 Three or More Sublot Test Results: When three or more sublot test results are available for a LOT, the variability-unknown, standard deviation method will be used to determine the estimated percentage of the LOT that is within the specification limits. The number of significant figures used in the calculations will be in accordance with requirements of AASHTO R11-06, Absolute Method.

334-8.2.3.1 Percent Within Limits: The percent within limits (PWL) and Pay Factors for the LOT will be calculated as described below. Variables used in the calculations are as follows:

x = individual test value (sublot)
n = number of tests (sublots)
s = sample standard deviation
$\Sigma(x^2)$ = summation of squares of individual test values
$(\Sigma x)^2$ = summation of individual test values squared
Q_U = upper quality index
USL = upper specification limit (target value plus upper specification limit from Table 334-8)

Q_L = lower quality index
LSL = lower specification limit (target value minus lower specification limit from Table 334-8)

P_U = estimated percentage below the USL
P_L = estimated percentage above the LSL

1. Calculate the arithmetic mean $\bar{X}$ of the test values:

$$\bar{X} = \frac{\sum x}{n}$$

2. Calculate the sample standard deviation (s):

$$s = \sqrt{\frac{n\sum(x^2) - (\sum x)^2}{n(n-1)}}$$

3. Calculate the upper quality index (Q_U):

$$Q_U = \frac{\text{USL} - \bar{\text{X}}}{\text{s}}$$

4. Calculate the lower quality index (Q_L):

$$Q_L = \frac{\bar{X} - LSL}{s}$$

5. From Table 334-9, determine the percentage of work below the USL (P_U).

6. From Table 334-9, determine percentage of work above the LSL (P_L) Note: If USL or LSL is not specified; percentages within (USL or LSL) will be 100.

7. If Q_U or Q_L is a negative number, then calculate the percent within limits for Q_U or Q_L as follows: enter Table 334-9 with the positive value of Q_U or Q_L and obtain the corresponding percent within limits for the proper sample size. Subtract this number from 100.00. The resulting number is the value to be used in the next step (Step 8) for the calculation of quality level.

8. Calculate the percent within limits (PWL) = (P_U + P_L) - 100

9. Calculate the Pay Factor (PF) for each quality characteristic using the equation given in 334-8.2.3.2.

Table 334-8 Specification Limits	
Quality Characteristic	Specification Limits
Passing No. 8 sieve (percent)	Target ± 3.1
Passing No. 200 sieve (percent)	Target ± 1.0
Asphalt Content (percent)	Target ± 0.40
Air Voids (percent)	4.00 ± 1.20
Density, vibratory mode (percent of G_{mm}):	93.00 + 2.00, - 1.20
Density, static mode (percent of G_{mm}):	92.00 + 3.00, - 1.50 (1)
(1): No vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer.	

Table 334-9 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
0.00	50.00	50.00	50.00	50.00
0.05	51.38	51.67	51.78	51.84
0.10	52.76	53.33	53.56	53.67
0.15	54.15	55.00	55.33	55.50
0.20	55.54	56.67	57.10	57.32
0.25	56.95	58.33	58.87	59.14
0.30	58.37	60.00	60.63	60.94
0.35	59.80	61.67	62.38	62.73
0.40	61.26	63.33	64.12	64.51
0.45	62.74	65.00	65.84	66.27

Table 334-9 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
0.50	64.25	66.67	67.56	68.00
0.55	65.80	68.33	69.26	69.72
0.60	67.39	70.00	70.95	71.41
0.65	69.03	71.67	72.61	73.08
0.70	70.73	73.33	74.26	74.71
0.75	72.50	75.00	75.89	76.32
0.80	74.36	76.67	77.49	77.89
0.85	76.33	78.33	79.07	79.43
0.90	78.45	80.00	80.62	80.93
0.95	80.75	81.67	82.14	82.39
1.00	83.33	83.33	83.64	83.80
1.05	86.34	85.00	85.09	85.18
1.10	90.16	86.67	86.52	86.50
1.15	97.13	88.33	87.90	87.78
1.20	100.00	90.00	89.24	89.01
1.25	100.00	91.67	90.54	90.19
1.30	100.00	93.33	91.79	91.31
1.35	100.00	95.00	92.98	92.37
1.40	100.00	96.67	94.12	93.37
1.45	100.00	98.33	95.19	94.32
1.50	100.00	100.00	96.20	95.19
1.55	100.00	100.00	97.13	96.00
1.60	100.00	100.00	97.97	96.75
1.65	100.00	100.00	98.72	97.42
1.70	100.00	100.00	99.34	98.02
1.75	100.00	100.00	99.81	98.55
1.80	100.00	100.00	100.00	98.99
1.85	100.00	100.00	100.00	99.36
1.90	100.00	100.00	100.00	99.65
1.95	100.00	100.00	100.00	99.85
2.00	100.00	100.00	100.00	99.97
2.05	100.00	100.00	100.00	100.00
2.10	100.00	100.00	100.00	100.00
2.15	100.00	100.00	100.00	100.00

Table 334-9 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
2.20	100.00	100.00	100.00	100.00
2.25	100.00	100.00	100.00	100.00
2.30	100.00	100.00	100.00	100.00
2.35	100.00	100.00	100.00	100.00
2.40	100.00	100.00	100.00	100.00
2.45	100.00	100.00	100.00	100.00
2.50	100.00	100.00	100.00	100.00
2.55	100.00	100.00	100.00	100.00
2.60	100.00	100.00	100.00	100.00
2.65	100.00	100.00	100.00	100.00

following equation:

334-8.2.3.2 Pay Factors (PF): Pay Factors will be calculated by using the

Pay Factor = (55 + 0.5 x PWL) / 100

The PWL is determined from Step (8) of 334-8.2.3.1.

334-8.3 Composite Pay Factor (CPF): A CPF for the LOT will be calculated based on the individual PFs with the following weighting applied: 35% Density (D), 25% Air Voids (V_a), 25% asphalt binder content (P_b), 10% Passing No. 200 (P_{-200}) and 5% Passing No. 8 (P_{-8}). Calculate the CPF by using the following formula:

$$CPF = [(0.350 \times PF\ D) + (0.250 \times PF\ V_a) + (0.250 \times PF\ P_b) + (0.100 \times PF\ P_{-200}) + (0.050 \times PF\ P_{-8})]$$

Where the PF for each quality characteristic is determined in either 334-8.2.2 or 334-8.2.3, depending on the number of sublot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the CPF for the LOT by the bid price per ton.

334-8.4 Payment: Payment will be made under:

Item No. 334- 1- Superpave Asphaltic Concrete - per ton.

SECTION 570 - PERFORMANCE TURF

570-1 Description.

Establish a growing, healthy turf over all areas designated in the Plans. Use sod in areas designated in the Plans to be sodded. Use seed, hydroseed, bonded fiber matrix, or sod in all other areas. Maintain turf areas until final acceptance of all contract work in accordance with Section 5-11.

570-2 Materials.

Meet the following requirements:

Turf Materials .....Section 981
Fertilizer.....Section 982
Water.....Section 983

570-3 Construction Methods.

570-3.1 General: Incorporate turf installation into the project at the earliest practical time.

Shape the areas to be planted to the plan typical sections and lines and grade shown in the Contract Documents.

Except in areas where the Contract Documents requires specific types of grass to match adjoining private property, any species of grass designated in Section 981 may be used. Use the methods and materials necessary to establish and maintain the initial grassing until acceptance of the Contract work in accordance with 5-11. All of the permanent grassing material shall be in place prior to final acceptance.

The City will only pay for replanting as necessary due to factors determined by the Engineer to be beyond control of the Contractor.

Complete all grassing on shoulder areas prior to the placement of the friction course on adjacent pavement.

570-3.2 Seeding: At the Contractor's option, wildflower seed may be included in the turf seeding operation or performed separately from the turf seeding.

Use of compost meeting the requirements of Section 987 as mulch is acceptable unless otherwise specified.

570-3.3 Sod: Place the sod on the prepared surface, with edges in close contact. Do not use sod which has been cut for more than 48 hours.

Place the sod to the edge of all landscape areas as shown in the Plans and as shown in the Design Standards.

Place rolled sod parallel with the roadway and cut any exposed netting even with the sod edge.

Monitor placed sod for growth of pest plants and noxious weeds. If pest plants and/or noxious weeds manifest themselves within 30 days of placement of the sod during the months April through October, within 60 days of placement of the sod during the months of November through March treat affected areas by means acceptable to the City at no expense to the City. If pest plants and/or noxious weeds manifest themselves after the time frames

described above from date of placement of sod, the Engineer, at his sole option, will determine if treatment is required and whether or not the Contractor will be compensated for such treatment. If compensation is provided, payment will be made as Unforeseeable Work as described in 4-4.

Remove and replace any sod as directed by the Engineer.

570-3.4 Hydroseeding: Use equipment specifically designed for mixing the mulch, seed, fertilizer, tackifier and dye, and applying the slurry uniformly over the areas to be hydroseeded.

Use mulch that does not contain reprocessed wood or paper fibers. Ensure that 50% of the fibers will be retained on a twenty-five mesh screen.

Mix fertilizer as required into the hydroseeding slurry.

Ensure that the dye does not contain growth or germination inhibiting chemicals. When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture- holding compounds.

570-3.5 Bonded Fiber Matrix (BFM): Meet the minimum physical and performance criteria of this Specification for use of BFM in hydroseeding operations or temporary non-vegetative erosion and sediment control methods.

Provide evidence of product performance testing, manufacturer's certification of training and material samples to the Engineer at least 7 calendar days prior to installation.

Provide documentation to the Engineer of manufacturer's testing at an independent laboratory, demonstrating superior performance of BFM as measured by reduced water runoff, reduced soil loss and faster seed germination in comparison to erosion control blankets.

Use only BFMs that contain all components pre-packaged by the manufacturer to assure material performance. Deliver materials in UV and weather resistant factory labeled packaging. Store and handle products in strict compliance with the manufacturer's directions.

When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture- holding compounds.

Meet the following requirements after application of the formed matrix:

Ensure that the tackifier does not dissolve or disperse upon re-wetting. Ensure that the matrix has no gaps between the product and the soil and that it provides 100% coverage of all disturbed soil areas after application.

Ensure that the matrix has no germination or growth inhibiting properties and does not form a water-repelling crust.

Ensure that the matrix is comprised of materials which are 100% biodegradable and 100% beneficial to plant growth.

Mix and apply the BFM in strict compliance with the manufacturer's recommendations.

Apply the BFM to geotechnically stable slopes at the manufacturer's recommended rates.

Degradation of BFM will occur naturally as a result of chemical and biological hydrolysis, UV exposure and temperature fluctuations. Re-application, as determined by the Engineer, will be required if BFM-treated soils are disturbed or water quality or turbidity tests show the need for an additional application. The work and materials for re-application, will be paid for as Unforeseeable Work.

570-3.6 Watering: Water all turf areas as necessary to produce a healthy and vigorous stand of turf. Ensure that the water used for turf irrigation meets the requirements of Section 983.

570-3.7 Fertilizing: Fertilize as necessary based on soil testing performed in accordance with Section 162. Refer to Section 982 for fertilizer rates.

For bid purposes, base estimated quantities on an initial application of 265 lbs/acre and one subsequent application of 135 lbs/acre of 16-0-8.

570-4 Turf Establishment.

Perform all work necessary, including watering and fertilizing, to sustain an established turf until final acceptance, at no additional expense to the City. Provide the filling, leveling, and repairing of any washed or eroded areas, as may be necessary.

Established turf is defined as follows:

1. An established root system (leaf blades break before seedlings or sod can be pulled from the soil by hand).
2. No bare spots larger than one square foot.
3. No continuous streaks running perpendicular to the face of the slope.
4. No bare areas comprising more than 1% of any given 1,000 square foot area.
5. No deformation of the turf areas caused by mowing or other Contractor equipment.
6. No exposed sod netting.
7. No pests or noxious weeds.

Monitor turf areas and remove all competing vegetation, pest plants, and noxious weeds (as listed by the Florida Exotic Pest Plant Council, Category I "List of Invasive Species", Current Edition, http://www.fleppc.org). Remove such vegetation regularly by manual, mechanical, or chemical control means, as necessary. When selecting herbicides, pay particular attention to ensure use of chemicals that will not harm desired turf or wildflower species. Use herbicides in accordance with 7-1.7.

If at the time that all other work on the project is completed, but all turf areas have not met the requirements for established turf set forth in 570-4, continuously maintain all turf areas until the requirements for established turf set forth in 570-4 have been met.

During the entire establishment period and until turf is established in accordance with this specification, continue inspection and maintenance of erosion and sedimentation control items in accordance with Section 104. Take responsibility for the proper removal and disposal of all erosion and sedimentation control items after turf has been established.

Notify the Engineer, with a minimum of seven calendar days advance notice, to conduct inspections of the turf at approximate 90-day intervals during the establishment period to determine establishment. Results of such inspections will be made available to the Contractor within seven calendar days of the date of inspection. Determination of an established turf will be based on the entire project and not in sections.

Upon the determination by the Engineer that the requirements of 570-4 have been met and an established turf has been achieved and all erosion and sedimentation control items have been removed, the Engineer will release the Contractor from any further responsibility provided for in this Specification.

The Contractor's establishment obligations of this specification will not apply to deficiencies due to the following factors, if found by the Engineer to be beyond the control of the Contractor, his subcontractors, vendors or suppliers:

1. Determination that the deficiency was due to the failure of other features of the Contract.

2. Determination that the deficiency was the responsibility of a third party performing work not included in the Contract or its actions.

The City will only pay for replanting as necessary due to factors determined by the City to be beyond the control of the Contractor.

570-5 Responsible Party.

For the purposes of this Specification, the Contractor shall be the responsible party throughout construction and establishment periods.

Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility for maintenance of all the work or facilities within the project limits of the Contract will terminate in accordance with 5-11; with the sole exception that the facilities damaged due to lack of established turf and the obligations set forth in this Specification for performance turf shall continue thereafter to be responsibility of the Contractor as otherwise provided in this Section.

570-6 Disputes Resolution.

The Contractor and the City acknowledge that use of the Statewide Disputes Review Board is required and the determinations of the Statewide Disputes Review Board for disputes arising out of the performance turf specification will be binding on both the Contractor and the City, with no right of appeal by either party, for the purposes of this Specification.

Any and all Statewide Disputes Review Board meetings after final acceptance of the Contract in accordance with 5-11 shall be requested and paid for by the Contractor. The City will reimburse the Contractor for all fees associated with meetings.

570-7 Failure to Perform.

Should the Contractor fail to timely submit any dispute to the Statewide Disputes Review Board, refuse to submit any dispute to the Statewide Disputes Review Board, fail to provide an established turf in accordance with 570-4 within one year of final acceptance of the

Contract in accordance with 5-11, or fail to compensate the City for any remedial work performed by the City in establishing a turf and other remedial work associated with lack of an established turf, including but not limited to, repair of shoulder or other areas due to erosion and removal of sediments deposited in roadside ditches and streams, as determined by the Statewide Disputes Review Board to be the Contractor's responsibility, the City shall suspend, revoke or deny the Contractor's certificate of qualification under the terms of
Section 337.16(d)(2), Florida Statutes, until the Contractor provides an established turf or makes full and complete payment for the remedial work performed by the City. In no case shall the period of suspension, revocation, or denial of the Contractor's certificate of qualification be less than six months. Should the Contractor choose to challenge the City's notification of intent for suspension, revocation or denial of qualification and the City's action is upheld, the Contractor shall have its qualification suspended for a minimum of six months or until the remedial action is satisfactorily performed, whichever is longer.

570-8 Method of Measurement.

The quantities to be paid for will be plan quantity in square yards based on the area shown in the Plans, completed and accepted.

570-9 Basis of Payment.

Prices and payments will be full compensation for all work and materials specified in this Section.

Payment will be made under:

Item No. 570- 1- Performance Turf - per square yard.

PROJECT 12089
"Coconut Isle Bridge Replacement"

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. "SPECIFICATIONS" referred to in the project documents are to include and incorporate the following:
   1. The written specifications package entitled Project 12089 – Coconut Isle Bridge Replacement.
      a.
   2. FLORIDA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION 2000 and the FLORIDA DEPARTMENT OF TRANSPORTATION DESIGN STANDARDS JANUARY 2000

1.2 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Intent of the drawings and specifications is to cover an installation complete in every respect. It is not necessarily intended to provide every detail on drawings or in the specifications. The City will not be responsible for absence of any detail which the Contractor may require nor for any special construction which may be found necessary as work progresses. If an item is either indicated or specified, it shall be considered sufficient for inclusion of said item in the contract. Contractor shall furnish and install materials and equipment normally furnished with such systems and as needed to complete a fully operational installation, whether mentioned or not, which are customary to the trade.

B. Incidental accessories not usually shown or specified, but which are necessary for the proper installation and operation shall be included in the work without additional cost to the City, as if herein depicted or specified.

C. Any apparatus, appliance, material or work not shown on drawings, but mentioned in specifications, or vice versa, shall be furnished, delivered and installed by the Contractor without additional cost to the City.

D. Drawings are diagrammatic and indicate the general arrangement of systems and work indicated (do not scale drawings). Consult the City Engineer for exact locations of fixtures, furniture, and equipment, etc. where these items are not definitively located on the drawings.

1.3 SUMMARY

A. This Section includes the following:

   1. Work covered by the Contract Documents.

2. Type of the Contract.
3. Work phases.
4. Work under other contracts.
5. City-furnished products.
6. Use of premises.
7. City's occupancy requirements.
8. Work restrictions.
9. Specification formats and conventions.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project 12089 – Coconut Isle Bridge Replacement.

1. Project Location: Coconut Isle Drive, Fort Lauderdale, Florida

B. Owner: City of Fort Lauderdale

1. City's Representative: Connie Hayman, Project Manager II

C. Engineer: Hardesty & Hanover, LLP; 1000 Sawgrass Corporate Parkway, Suite 544 Sunrise Florida, 33323.

D. The Work consists of the following:

1. Full replacement of the existing bridge, including superstructure, substructure, bulkheads, approach slabs and utilities.

1.5 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1. Division of work: The division of work among it’s separate Subcontractors is the responsibility of the General Contractor, and the City assumes no responsibility to act as arbitrator to establish subcontract limits between any sections of the work.

1.6 WORK PHASES

A. Before commencing work. submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of City's personnel for all phases of the Work.

1.7 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: The City has the right to award other contracts in connection with the work, and Contractor shall properly coordinate with any such Contractors.

C. Concurrent Work: City will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. No concurrent work is anticipated at this time.

1.8 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by City's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. City Occupancy: Allow for City occupancy of Project site.
2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to City, City's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

   a. Schedule deliveries to minimize use of driveways and entrances.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.9 CITY'S OCCUPANCY REQUIREMENTS

A. Full City Occupancy: City will not occupy site during entire construction period. Cooperate with City during construction operations to minimize conflicts. Perform the Work so as not to interfere with City's day-to-day operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from City and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to City of activities that will affect City's operations.

1.10 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:30 a.m. to 4:30 p.m., Monday through Friday, except otherwise indicated.

1. Weekend Hours: 7:30 a.m. to 4:30 p.m. only with prior authorization by the City.
2. Early Morning Hours: Work performed prior to 7:30 a.m. cannot create excessive noise that would disturb adjacent properties.
3. Hours for Utility Shutdowns: 48 hours notice must be given to the City if any utilities are to be shut down for more than 4 hours.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by City or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineering Inspector not less than 2 days in advance of proposed utility interruptions.

1.11 SPECIFICATION FORMATS AND CONVENTIONS

1. Specification Format: The Specifications are organized into Divisions and Sections using the 3-division FDOT Standard Specification format.

B. 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. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. 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.

END OF SECTION

PROJECT 12089

SECTION 15100
VALVES AND OPERATORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:

1. Product data sheets for make and model.
2. Complete catalog information, descriptive literature, Specifications, and identification of materials of construction.

PART 2 PRODUCTS

2.01 GENERAL

A. Valve to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and accessories as appropriate and as shown on the Drawings for a complete operation.

B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

C. Valve same size as adjoining pipe.

D. Valve ends to suit adjacent piping.

E. Size operator to operate valve for the full range of pressures and velocities.

F. Valve to open by turning counterclockwise.

G. Factory mount operator, actuator, and accessories.

2.02 MATERIALS

A. Brass and bronze valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.

B. Approved Alloys Are of the Following ASTM Designations:

1. B61, B62, B98 (Alloy UNS No. C65100, C65500, or C66100), B139 (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
2. Stainless steel Alloy 18-8 may be substituted for bronze.

2.03 FACTORY FINISHING

A. Epoxy Lining and Coating: In accordance with manufacturer's instructions for on-site soil and groundwater conditions and Section 02502, Ductile Iron Pipe and Fittings.

B. Exposed Valves:

1. In accordance with manufacturer's instructions for onsite soil and groundwater conditions.
2. Safety isolation valves and lockout valves with handles, handwheels, or chain wheels "safety yellow."

2.04 VALVES

A. Gate Valves:

1. All valves, unless otherwise specified, shall be the product of one manufacturer.
2. Gate valves shall be resilient seat gate valves for 150 psi minimum working pressure, conforming to AWWA C515 or C509.
   a. The gate valves shall have a high strength, bronze, nonrising stem.
   b. Valves shall have neoprene, Buna-N or equal, but not natural rubber, O-ring stem seals and be of a design that allows replacement of the O-rings while the valve is in service under pressure.
   c. Operating nuts shall be AWWA 2-inch square with skirts and open by turning the nut counter clockwise.
   d. Valve body, bonnet, and gate shall be ductile iron conforming to ASTM A536. Shell thickness of body and bonnet components shall conform to Table 2, Section 4.4 of AWWA C509 or C515.
3. Valve body and bonnet shall be coated on all interior and exterior surfaces with a two-part epoxy conforming to the requirements of AWWA C550. Coating shall be suitable for potable water service.
4. Gates shall be covered with rubber over all interior and exterior ferrous surfaces. Rubber shall be securely bonded to the gate body including the part that houses the stem nut.
5. Direct-buried gate valves shall be polyethylene encased and shall have Type 304 stainless steel bonnet bolts.
6. Gate valves shall be as manufactured by American Flow Control Series 2500, Mueller Series 2360 and 2361; or Clow/Kennedy.
7. Tapping valves shall conform to these Specifications. Tapping sleeves shall be in accordance with the provisions of Section 02500, Conveyance Piping – General. Tapping valves shall be mounted in a horizontal position. Tapping valves shall be compatible with the tapping sleeve – no field grinding will be permitted.

B. Ball Valves:

1. Ball Valve 2 Inches and Smaller for General Water and Air Service: All-bronze, three-piece body type, screwed ends, full bore ports, Teflon seat, blowout-proof stem, hand lever operator, rated 150 psi SWP, 400-pound WOG minimum.
   a. Manufacturers and Products:
      1) Nibco, Inc.; T-595-Y.
      2) Grinnell Supply Sales Co.; Figure 3810.

C. Plug Valves:

1. All valves, unless otherwise specified, shall be the product of one manufacturer.
2. Eccentric Valve 3 Inches through 12 Inches:
   a. Nonlubricated type rated 175 psig CWP.
   b. Drip-tight shutoff with pressure from either direction. Valves will be rejected if they are delivered to the site with no indication that they meet this requirement.
   c. Cast iron body with flanged ends or grooved ends in accordance with AWWA C606 for rigid joints, mechanical joint ends for buried valve.
   d. Plug shall be cast iron with round or rectangular port or no less than 80 percent of the connecting pipe area and coated with Buna-N or Hycar.
   e. Seats shall be welded nickel.
   f. Stem bearing shall be self-lubricating stainless steel, bronze or reinforced Teflon.
   g. Stem seal shall consist of multiple V-rings, U-cups, or O-rings of nitrile rubber with grit seals on stem.
   h. For buried service, provide external epoxy coating.
   i. For wastewater service, valves shall be lined with a two-part epoxy in accordance with AWWA C550.
   j. Valve 3 through 4 inches with wrench lever manual operator.
   k. Valve 6 through 12 inches with totally enclosed, geared, manual operator with handwheel, 2-inch nut, or chain wheel.
      1) Size operator for 1.5 times the maximum operating shutoff pressure differential for direct or reverse pressure, whichever is greater.
      2) For buried service, provide completely sealed operator filled with heavy lubricant.
   l. Manufacturer and Products: DeZurik; Series PEC, Clow, or Val-matic Camcentric.
3. Eccentric Valve 14 Inches through 20 Inches:
   a. Nonlubricated type rated 150 psig CWP.
   b. Driptight shutoff with pressure from either direction. Valves will be rejected if they are delivered to the site with no indication that they meet this requirement.
   c. Cast iron body with flanged ends or grooved ends in accordance with AWWA C606 for rigid joints, mechanical joint ends for buried valve.

d. Plug shall be cast iron with round or rectangular port or no less than 80 percent of the connecting pipe area and coated with Buna-N or Hycar.
e. Seats shall be welded nickel.
f. Stem bearing shall be self-lubricating stainless steel, bronze, or reinforced Teflon.
g. Stem seal shall consist of multiple V-rings, U-cups, or O-rings of nitrile rubber with grit seals on stem.
h. For buried service, provide external epoxy coating.
i. For wastewater service, valves shall be lined with a two-part epoxy in accordance with AWWA C550.
j. Totally enclosed, geared, manual operator with handwheel, 2-inch nut, or chain wheel.
    1) Size operator for 1.5 times the maximum operating shutoff pressure differential for direct or reverse pressure, whichever is greater.
    2) For buried service, provide completely sealed operator filled with heavy lubricant.
k. Manufacturer and Products: DeZurik; Series PEC, Clow, or Val-matic Camcentric.

4. Eccentric Valve 24 Inches through 48 Inches:
    a. Nonlubricated type rated 150 psig CWP.
    b. Driptight shutoff with pressure from either direction. Valves will be rejected if they are delivered to the site with no indication that they meet this requirement.
    c. Cast iron body with flanged ends or grooved ends in accordance with AWWA C606 for rigid joints, mechanical joint ends for buried valve.
    d. Plug shall be cast iron with round or rectangular port or no less than 80 percent of the connecting pipe area and coated with Buna-N or Hycar.
    e. Seats shall be welded nickel.
    f. Stem bearing shall be self-lubricating stainless steel, bronze or reinforced Teflon.
    g. Stem seal shall consist of multiple V-rings, U-cups, or O-rings of nitrile rubber with grit seals on stem.
    h. For buried service, provide external epoxy coating.
    i. For wastewater service, valves shall be lined with a two-part epoxy in accordance with AWWA C550.
    j. Totally enclosed, geared, manual operator with handwheel, 2-inch nut, or chain wheel.
        1) Size operator for 1.5 times the maximum operating shutoff pressure differential for direct or reverse pressure, whichever is greater.
        2) For buried service, provide completely sealed operator filled with heavy lubricant.
    k. Manufacturer and Products: DeZurik; Series PEC, Pratt Ballmatic, Clow, or Val-matic Camcentric.

D. Butterfly Valves:

1. General:
   a. All valves, unless otherwise specified, shall be the product of one manufacturer.
   b. Valves shall meet the requirements or AWWA C504 except as modified herein.
   c. Valves shall be Class 150B.
   d. Valves shall be flanged, short-body design for exposed service and mechanical joint design for buried service with joints as described in Section 02500, Conveyance Piping - General.
   e. Actual port diameter shall not be less than 1 inch smaller than the nominal pipe size.
   f. Valves shall be equipped with an adjustable, mechanical limiting device in the operator to prevent over travel of the disc in the open and closed position. Disc position stops in the valve body are not permitted.
   g. Valves shall be lined with a two-part epoxy in accordance with AWWA C550. Coating shall be suitable for potable water service.
2. Valve bodies shall be constructed of ASTM B126 Class B cast iron and shall have two integrally cast trunnions for shaft bearings.
3. Valve Seats:
   a. Shall be field adjustable around the full circumference of the body without interruption of flow for all valves 24 inches and larger.
   b. For valves in buried service, seats shall be incorporated into the valve body. For above grade service, seats may be incorporated into the valve body or valve disc.
   c. Seats shall be replaceable without dismantling the operator, disc or shaft and without removing the valve from the line.
   d. Valve seats shall be Buna-N unless otherwise specified.
   e. Seats bond shall be tested at 75 pounds in accordance with ASTM D429, Method B for valves 20 inches and smaller. For valves larger than 20 inches, seats shall be retained in the body by mechanical means without retaining rings, segments, screws or hardware of any kind protruding into the flow stream.
4. Bearings:
   a. Valve bearings shall be the sleeve type.
      1) 100 percent nylon or Teflon for valves 20 inches and smaller.
      2) Bearings shall be Teflon with fiberglass backing for valves 24 inches and larger.
   b. Bearings shall be self-lubricating and bearing load shall not exceed 1/5 of the compressive strength of the bearing or shaft material.
5. Valve Discs:
   a. Discs shall operate through a 90-degree angle from fully closed to fully open.
   b. Valve discs shall be cast iron alloy ASTM A436 Type 1, ASTM A48 or ASTM A126 for valves 20 inches and smaller and ASTM A48 cast iron or ASTM A536 ductile iron for valves 24 inches and larger.

c. Valve discs shall have a Type 316 stainless steel seating edge and shall not have any hollow chambers.

6. Shafts and Seals:
   a. Valve shafts shall be Type 316 stainless steel meeting the minimum requirements of AWWA C504.
   b. Valve shafts shall be one piece for valves 20 inches and smaller and two piece for valves 24 inches and larger.
   c. Shaft seals shall be self-compensating, split V type and shall be adjustable and replaceable without removing the operator and/or the shaft, except for buried applications.
   d. Shaft seals shall be Buna-N unless otherwise specified.
7. Valves for buried service shall be totally enclosed, fully gasketed, grease packed and designed to operate indefinitely when submerged under a minimum 20 feet of water.
8. Manufacturers: Valmatic – American BFV, Mueller Lineseal III, Pratt - Groundhog, or Dezurik – BAW.

E. Check Valves:

1. Swing Check Valve 2-1/2 Inches through 12 Inches: Flanged end, cast iron body, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft, outside lever and spring, rated 125-pound SWP, 200-pound WOG. Check valves shall meet requirements of AWWA C508.
   a. Manufacturers and Products:
      1) GA Series 250 Swing Check
      2) Milliken Swing Check.
      3) American Flow Control Series 50SC or 600
   b. Valves shall be lined with a two-part epoxy in accordance with AWWA C550.
2. Resilient Seat Check Valve 2-1/2 Inches through 16 Inches: Flanged end, cast iron body and bonnet, rubber-encapsulated, DI or steel disc, rated 125-pound SWP, 200 pound WOG. Check valves shall meet requirements of AWWA C508.
   a. Manufacturers and Products:
      1) American Flow Control Series 2100.
      2) Milliken Flex Check.
      3) Val-Matic Swingflex.
   b. Valves shall be lined with a two-part epoxy in accordance with AWWA C550
3. Type V642 Reduced Pressure Backflow Preventer: Two check valves, independent relief between the valves; testing cock, in accordance with AWWA C511, rated 175-pound CWP, meets requirements of USC Cross Connection Control Laboratory.
   a. Manufacturers and Products:
      1) FEBCO; Model 825Y, 825YD.
      2) Hersey; Model FRP II, 6CM.

F. Self-Contained Automatic Valves:

1. Sewage Air and Vacuum Release Valve:

a. Combination valve, suitable for sewer service, automatically provides air release during normal operation, exhausts air during the filling of a system and allows air to re-enter during draining or when vacuum occurs.
b. Rated 150 psi working pressure and built with a special short body, and have cast iron, ductile iron, or semi-steel body, covers with stainless steel float and trim.
c. Sewage air and vacuum valve to be fitted with blowoff valve, quick disconnect couplings, and a minimum 6 feet of hose to permit backflushing after installation without dismantling valve.
d. Provide with service saddle on main and ball corporation stop (Ford FB500 style; or equal).
e. Size as shown on the Drawings or 2 inches minimum.
f. Manufacturers and Products:
1) International Valve Marketing, Inc., (Vent-O-Mat - Series RGX).
2) APCO Valve and Primer Corp – 440 Series; or equal.
3) Val-Matic Series 301A-308.

2. Water Combination Air and Vacuum Release Valve:
a. Single body, combination valve suitable for water service, automatically provides air release during normal operation, exhausts air during the filling of a system and allows air to re-enter during draining or when vacuum occurs.
b. Rated 150 psi working pressure and built with a special short body, and have cast iron, ductile iron, or semi-steel body, covers with stainless steel float and trim.
c. Provide with service saddle on main and ball corporation stop (Ford FB500 style; or equal).
d. Size as shown on the Drawings, or 2 inches minimum.
e. Manufacturers and Products:
1) International Valve Marketing, Inc., (Vent-O-Mat - Series RBX).
2) APCO Valve and Primer Corp. - 140C Series; or equal.
3) Val-Matic Series 200.

2.05 OPERATORS

A. Manual Operator:

1. General:
a. Operator force not to exceed 40 pounds under any operating condition, including initial breakaway. Gear reduction operator when force exceeds 40 pounds.
b. Operator self-locking type or equipped with self-locking device.
c. Position indicator on quarter-turn valves.
d. Worm and gear operators one-piece design worm-gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators threader steel reach rods with internally threaded bronze or ductile iron nut.

2. Exposed Operator:
a. Galvanized and painted handwheels.

b. Lever operators allowed on quarter-turn valves 8 inches and smaller.
c. Cranks on gear type operators.
d. Valve handles to take a padlock, and wheels a chain and padlock.

3. Buried Operator:
   a. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2 inches and smaller shall have cross handle for operation by forked key. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
   b. Design buried service operators for quarter-turn valves to withstand 450 foot-pounds of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 10 psi.
   c. Buried valves shall have extension stems, bonnets, and valve boxes.

2.06 ACCESSORIES

A. Cast Iron Valve Box: Designed for traffic loads, sliding type, with minimum of 6-inch ID shaft.

1. Box: Cast iron with minimum depth of 9 inches.
2. Lid: Cast iron.
   a. Minimum depth 3 inches.
   b. Marked SEWER or WATER, as appropriate.
   c. Turn to retain with locking bolt.
3. Extensions: cast iron.
   a. O-ring seal between sections.
   b. Self-centering alignment ring.
4. American Flow Control Trench Adaptor or equal.

B. Provide service saddles and fittings in accordance with Section 02518, Water Connections, for ARV's.

PART 3 EXECUTION

3.01 INSTALLATION

A. Flange Ends:

1. Flanged valve boltholes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

B. Screwed Ends:

1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

C. Valve Orientation:

1. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above finish floor, unless otherwise shown.
3. Orient butterfly valve shaft so that unbalanced flows or eddies are equally divided to each half of the disc, i.e., shaft is in the plane of rotation of the eddy.
4. If no plug valve seat position is shown, locate as follows:
   a. Horizontal Flow: The flow shall produce an “unseating” pressure, and the plug shall open into the top half of valve.
   b. Vertical Flow: Install seat in the highest portion of the valve.

D. Install a line size ball valve and union upstream of each solenoid valve, in-line flow switch, or other in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.

E. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.

F. Extension Stem for Operator: Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.

G. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of the valve.

3.02 TESTS AND INSPECTION

A. Valve may be either tested while testing pipelines, or as a separate step.

B. Test that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other, in both directions for two-way valve and applications.

C. Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.

D. Count and record number of turns to open and close valve; account for any discrepancies with manufacturer's data.

E. Set, verify, and record set pressures for all relief and regulating valves.

F. Test hydrostatic relief valve seating; record leakage. Adjust and retest to maximum leakage of 0.1 gpm per foot of seat periphery.

END OF SECTION

SECTION 015900 – CONSTRUCTION SIGN

PART 1 GENERAL

Contractor, at contractor's expense, shall furnish and install a **4' x 8'** sign (with white painted posts) prior to start of construction. A sample sign template is below but is not specific to the project. The exact style and design of the sign will be provided by the CITY to the Contractor during the preconstruction meeting in PDF format.

See Page 2, "Construction Sign Request Form", for information on the sign for this Project.

Construction Sign Request Form

Title (Bold):

Title (Not Bold):

What's Happening?

Benefits:

Number of Neighbors Benefitted:

Cost:

Month and Year of Expected Completion:

Contractor:

Phone: 954-828-8000

We're Working On:

Project Manager Signature

Date

Senior Project Manager Signature

Date

END OF SECTION

SECTION 02500
CONVEYANCE PIPING - GENERAL

PART 1 GENERAL

1.01 DELIVERY, STORAGE, AND HANDLING

A. In accordance with manufacturer's recommendations and as specified in the individual Specification(s) following this Section.

B. Marking at Plant: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer's identification, specification standard, diameter of pipe, pipe class, and other information required for type of pipe.

C. Pipe, specials, and fittings received at Project site in damaged condition will not be accepted.

D. Gasket Storage: Store rubber gaskets in cool, well ventilated place and do not expose to direct rays of sun. Do not allow contact with oils, fuels, petroleum, or solvents.

E. Handling:

1. Heavy canvas, or nylon slings of suitable strength shall be used for lifting and supporting materials. Do not use chains or cables.
2. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to workmen. Slings shall bear uniformly against pipe.
3. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage pipe. This includes storage area and along pipe trench.

PART 2 PRODUCTS

2.01 PIPE

A. As specified in the individual Specification(s) following this Section and as shown on the Drawings.

B. Color Coding for Water Mains:

1. All pipe used for water main applications shall be color-coded blue in accordance with FAC 62-555.320(21)(b)(3).
2. Continuous blue stripes, parallel to the axis of the pipe, shall be applied using tape or paint applied to the dry pipe exterior surface.
3. Pipe striped during manufacture shall have stripes applied at 90-degree intervals around the pipe that remain intact following installation of the pipe.

4. Pipe striped during installation shall be in a continuous line along the top of the pipe. Pipes 24 inches and greater shall have two additional stripes on each side.
5. Aboveground water main piping shall be color-coded or marked similar to underground piping.

2.02 JOINTS

A. As specified in the individual Specification(s) following this Section.

2.03 COUPLINGS

A. General:

1. Coupling linings for use in potable water systems shall be in conformance with NSF 61B. Linings for wastewater piping shall be in accordance with the provisions of Section 02502, Ductile Iron Pipe and Fittings.
2. Couplings shall be rated for appropriate operating pressure and hydrostatic test pressure.
3. Exposed, bolted, sleeve-type couplings shall be lined and coated with fusion bonded epoxy in accordance with AWWA C213.
4. Buried, bolted, sleeve-type couplings shall be lined and coated with fusion bonded epoxy in accordance with AWWA C213.

B. For Pipe with Plain Ends:

1. Bolted, sleeve-type couplings, in accordance with AWWA C219.
2. Fabricated steel, mechanical slip-type expansion joints, in accordance with AWWA C221.

C. Unless thrust restraint is provided by other means, bolted, sleeve-type couplings shall be harnessed. Harness details shall be in accordance with requirements of appropriate reference standard or as shown on Drawings.

D. For Pipe with Grooved Ends:

1. Grooved couplings, in accordance with AWWA C606. System shall provide for flexible or rigid joints as shown on Drawings.
2. Exposed couplings shall be lined and coated with fusion bonded epoxy in accordance with AWWA C213.
3. Buried couplings shall be lined and coated with fusion bonded epoxy in accordance with AWWA C213.

E. For Pipe with Flanged Ends:

1. Flanged coupling adapters, in accordance with AWWA C219.
2. Dismantling joints for connecting flanged pipe shall be AWWA C219 compliant. Studs and nuts provided to seal gasket shall be separate and independent from tie-bar restraint system.

F. Bolting Materials: As recommended by coupling manufacturer for specified conditions.

2.04 SLEEVES

A. Sleeves shall be long or short pattern as appropriate to the application conforming to AWWA C110.

B. Sleeves shall be mechanical joint with restraint if required, provided by external mechanical joint restraints.

C. Sleeves shall have a minimum pressure rating of 250 psi.

D. Linings and coatings ductile iron sleeves shall be in accordance with the provisions of Section 02502, Ductile Iron Pipe and Fittings.

2.05 TAPPING SLEEVES – DUCTILE IRON

A. Ductile iron tapping sleeves are preferred for force main and water main taps.

B. Tapping sleeves shall meet ASTM A536 Grade 65-45-12.

C. Side flange seals shall be O-ring type with a round, oval, or rectangular cross-section.

D. Contractor shall inspect and/or verify diameter of the pipe to be tapped and order the correct sleeve.

E. Sleeves shall be coated in accordance with the provisions of this Specification.

F. Tapping sleeve and tapping valve shall be of the same or compatible manufacturer to assure proper fit of the aligning ring on the valve and the recess on the sleeve. No post-factory modifications to either the sleeve or valve will be permitted.

G. Tapping sleeve shall be American Flow Control Series 1004 or 2800, Mueller H-615, US Pipe T-9 or Clow F-5205.

H. Tapping machine and cutter shall provide the full-size of the tapped connection.

I. The coupon shall be removed from the pipe shall be given to the PCM.

2.06 TAPPING SLEEVES - STEEL

A. Steel tapping sleeves are acceptable for use where ductile iron sleeves are not practical and as approved by the Engineer.

B. Tapping sleeve composed of two halves of heavy welded steel, bolting together on the pipe and sealing against a concave Buna-N wedge gasket around the nozzle opening. Both halves of the sleeve are fabricated to accurately conform to the outside diameter of the ductile iron host pipe and to provide reinforcement without the use of shims or pads.

C. The sleeve half opposite the nozzle shall be solid and shall not consist of straps or U-bolts. Sleeve and nozzle shall be fabricated from ASTM 285, Grade C, carbon steel. Branch leg flange shall conform to AWWA, Class D, Schedule C-207, 150-pound drilling to match the tapping valve. The flange face shall be recessed to accommodate the tapping valve in accordance with MSS-SP60. All steel shall meet the requirements of ASTM A36, as a minimum. All weldments shall be braced and stress relieved.

D. The ferrous metal parts of the fitting shall receive a factory applied fusion-bonded, epoxy coating, the 12-mil minimum dry film thickness in accordance with AWWA C213.

E. The minimum wall thickness of the sleeve shall be 0.375 inches.

F. Tapping sleeve shall be pressure rated to 150 psi, minimum.

G. Tapping sleeve shall be, Dresser Style 630, JCM Series 412; or equal.

H. Tapping machine and cutter shall provide the full-size of the tapped connection.

I. The coupon removed from the pipe shall be given to the PCM.

2.07 SERVICE SADDLES

A. Service saddles shall be ductile iron with double stainless steel straps conforming to AWWA C-111/A.21.11-00.

2.08 SLAB, FLOOR, WALL, AND ROOF PENETRATIONS

A. Modular Mechanical Seal:

1. Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.
2. Assemble interconnected rubber links with Type 316 stainless steel bolts, nuts, and pressure plates.
3. Size modular mechanical seals according to manufacturer's instructions for the size of pipes shown to provide a watertight seal between pipe and wall sleeve opening.
4. Manufacturers and Products:
   a. Thunderline/LinkSeal, Div. Of PSI, Houston, TX; Link-Seal.
   b. Calpico, Inc., South San Francisco, California; Sealing Linx.

c. Advance Products and Systems, Lafayette, Louisiana; Innerlynx.

B. Wall Sleeves:

1. Diameter ends, and length shall be as shown on Drawings.
2. Shall include integral seep ring to minimize seepage between metal sleeve and concrete.

C. Wall Couplings:

1. Diameter ends, and length shall be as shown on Drawings.
2. Wall couplings shall provide flexible mechanical joint.
3. Body and end rings shall be coated with fusion bonded epoxy.
4. Body shall include integral seep ring.
5. Shall comply with AWWA C219.

D. If core drilling is required for penetrations of existing concrete walls or slabs, locations of drilling shall be determined by radiograph to avoid damage to reinforcing steel and conduits.

2.09 FLANGES, FLANGE GASKETS, AND BOLTING MATERIALS

A. As specified in individual Specifications following this Section.

B. Flanges, bolting materials, and flange gaskets for steel flanges shall conform to AWWA C207.

C. Flanges, bolting materials, and flange gaskets for ductile iron flanges shall conform to AWWA C110 and C115.

2.10 INSULATING FLANGES AND COUPLINGS

A. Dielectric Flange Manufacturers:

1. Pipeline Seal and Insulator, Inc.; Houston, Texas.
2. Central Plastics Co.; Shawnee, Oklahoma.
3. Calpico, Inc.; South San Francisco, California.

B. Insulating Flanges:

1. Bolt holes sized as required.
2. Manufacturers and Products:
   a. Dresser Industries; Style 39.
   b. Baker Coupling Company, Inc.; Series 216.

2.11 PIPE LOCATING TAPE

A. As specified in Section 02320, Trench Backfill.

2.12 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Granular material as specified in Section 02320, Trench Backfill.

2.13 TRENCH STABILIZATION MATERIAL

A. As specified in Section 02320, Trench Backfill.

PART 3 EXECUTION

3.01 GENERAL

A. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.

B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of pipe furnished.

C. Distributing Materials: Place materials along trench only as will be used each day, unless otherwise approved by Engineer. Placement of materials shall not be hazardous to traffic or to general public, obstruct access to adjacent property, or obstruct others working in the area.

3.02 EXAMINATION

A. Verify size, material, joint types, elevation, and horizontal location of existing pipeline to be connected to a new pipeline or new equipment.

B. Inspect the size and location of structure penetrations to verify the adequacy of wall pipes, sleeves, and other openings.

C. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Prepare trench as specified in Section 02316, Excavation.

B. Unless otherwise permitted by Engineer, the maximum length of the open trench shall not exceed 400 feet.

C. Trench Grade:

1. Grade bottom of the trench by hand to specified line and grade, with proper allowance for pipe thickness and pipe base, when specified. Trench bottom shall form a continuous and uniform bearing and support for pipe between bell holes.
2. Before laying each section of pipe, check grade and correct irregularities found. Grade may be disturbed for removal of lifting tackle.

D. Pipe Bedding: Place and compact pipe bedding material as follows:

1. Install to full width of trench, from the following depths below bottom to springline of pipe:
   a. For Pipe 12-Inch Diameter: 4 to 6 inches.
   b. For Pipe Larger than 12-Inch Diameter: 6 to 8 inches.
2. Compact to at least 98 percent of its maximum density as determined by AASHTO T180.

3. Ensure that no unfilled or uncompacted areas occur beneath pipe.

E. Bell (Joint) Holes: At each joint, dig bell holes of ample dimensions in bottom of trench, and at sides where necessary, to permit joint to be made properly and to permit easy visual inspection of entire joint.

3.04 INSTALLATION

A. General:

1. Provide and use proper implements, tools, and facilities for safe and proper prosecution of Work.
2. Lower pipe, fittings, and appurtenances into trench, piece by piece, by means of a crane, slings, or other suitable tools and equipment, in such a manner as to prevent damage to pipe materials, protective coatings and linings.
3. Do not drop or dump pipe materials into trench.
4. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.
5. Install individual pipe lengths in according to approved lay diagram. Misplaced pipe shall be removed and replaced.
6. Inspect pipe and fittings before installation, clean ends thoroughly, remove foreign matter and dirt from inside.
7. Flanged Joints:
   a. Install perpendicular to pipe centerline.
   b. Bolt Holes: Straddle vertical centerline, aligned with connecting equipment flanges or as shown on Drawings.
   c. Use torque-limiting wrenches to provide uniform bearing and proper bolt tightness.
   d. Flange Type: Use flat-faced flange when joining with flat-faced ductile or cast iron flange.
8. Couplings:
   a. Install in accordance with manufacturer's written instructions.
   b. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
   c. Do not remove pipe coating. If damaged, repair before joint is made.
   d. Clean and lubricate gaskets before installation.
   e. Tighten coupling bolts progressively, drawing up bolts on opposite sides gradually until bolts have uniform tightness.

B. Cleaning Pipe and Fittings:

1. Remove lumps, blisters, and excess coating from bell and spigot ends of each pipe. Wire brush outside of spigot and inside of bell and wipe clean, dry, and free from oil and grease before pipe is laid.
2. Wipe ends of mechanical joint pipe and fittings and of rubber gasket joint pipe and fittings clean of dirt, grease, and foreign matter.

C. Laying Pipe:

1. Direction of Laying: Lay pipe with bell end facing in direction of laying. For lines on an appreciable slope, face bells upgrade at discretion of Engineer.
2. Mechanical Joint, Push-On Joint, and Restrained Joint Pipe: After first length of pipe is installed in trench, secure pipe in-place with approved backfill material tamped under and along sides to prevent movement. Keep ends clear of backfill. After each section is jointed, place backfill as specified to prevent movement.
3. Take precautions necessary to prevent floating of pipe prior to completion of backfill operation.
4. When using movable trench shield, take necessary precautions to prevent pipe joints from pulling apart when moving shield ahead.
5. Do not allow foreign material to enter pipe while it is being placed in trench.
6. Close and block open end of last laid section of pipe to prevent entry of foreign material or creep of gasketed joints when laying operations are not in progress, at close of day's work, or whenever workers are absent from job.
7. Pipe shall be installed in a straight alignment and deflections made as required after the joint has been completed.

D. Joining Push-On Joint Pipe and Mechanical Joint Fittings:

1. Join pipe with push-on joints and mechanical joint fittings in strict accordance with manufacturer's recommendations.
2. Provide special tools and devices, such as, special jacks, chokers, and similar items required for installation.
3. Lubricate all pipe gaskets and pipe ends using lubricant furnished by pipe manufacturer. No substitutes will be permitted.
4. Clean ends of fittings of dirt, mud, and foreign matter by washing with water and scrubbing with a wire brush, after which, slip gland and gasket on plain end of pipe. Lubricate end of pipe to facilitate sliding gasket in place, then guide fitting onto spigot of pipe previously laid.

E. Cutting Pipe:

1. General: Cut pipe for inserting valves, fittings, or closure pieces in a neat and workmanlike manner without damaging pipe or lining and so as to leave a smooth end, at right angles to axis of pipe.
2. Pipe: Cut pipe with milling type cutter or saw. Do not flame cut.
3. Dressing Cut Ends: Dress cut end of mechanical joint pipe to remove sharp edges or projections, which may damage rubber gasket. Dress cut ends of push-on joint pipe by beveling, as recommended by manufacturer.

F. Buried Pressure Pipe:

1. Concrete Encased or Embedded Pipe: Do not encase joints in concrete unless specifically shown on Drawings.
2. Placement:
   a. Keep trench dry until pipe laying and joining is completed. If the excavation cannot be effectively dewatered the Contractor shall propose alternate pipe installation methodology for approval by

the Engineer prior to proceeding. All requirements of Section 02320, Trench Backfill, will remain in effect.

b. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
c. Measure for grade at pipe invert, not at top of pipe.
d. Excavate trench bottom and sides of ample dimensions to permit proper joining, welding, visual inspection, and testing of entire joint.
e. Prevent foreign material from entering pipe during placement.
f. Close and block open end of last laid pipe section when placement operations are not in progress and at close of day's work.
g. In general, lay pipe upgrade with bell ends pointing in direction of laying.
h. Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of spigot into bell. If joint deflection of standard pipe lengths will not accommodate horizontal or vertical curves in alignment, provide:
    1) Shorter pipe lengths.
    2) Special mitered joints.
    3) Standard or special fabricated bends.
i. Check gasket position with feeler gauge to assure proper seating.
j. After joint has been made, check pipe alignment and grade.
k. Place sufficient pipe zone material to secure pipe from movement before next joint is installed.
l. Prevent uplift and floating of pipe prior to backfilling.

3. Tolerances:
    a. Deflection From Horizontal Line: Maximum 2 inches.
    b. Deflection From Vertical Line: Maximum 1 inch.
    c. Joint Deflection: Maximum of 75 percent of manufacturer's recommendation.
    d. Horizontal position of pipe centerline on alignment around curves maximum variation of 1 foot from position shown.
4. Cover Over Top of Pipe: Minimum 3 feet, unless otherwise shown.
5. Disposal of Excess Excavated Material: As specified in Section 02316, Excavation.

G. Line and Grade:

1. No high points will be allowed between air valves on pressure piping.
2. Maintain pipe grade between invert elevations to provide minimum clearance at air valve locations from existing ground surface to top of pipe.
3. Install air valves as shown on the Drawings and as verified in the field and field verify intervening low points. When field conditions warrant, exceptions may be made upon approval of Engineer.
4. Deviations exceeding 1/2 inch from specified line or 1/4 inch from specified grade will not be allowed without express approval of Engineer.
5. Pipeline sections that are not installed to elevations shown or installed as approved by Engineer shall be reinstalled to proper elevation.

3.05 THRUST RESTRAINT

A. Location: At pipeline tees, plugs, valves, caps, bends, and locations where unbalanced forces exist, and as shown on the Drawings.

B. All pressure pipe will be restrained at all valves and fittings. Provide additional restraint as shown on the Drawings.

C. Use of thrust blocks is not permitted.

3.06 CORROSION PROTECTION

A. Buried Pipe: As specified in the individual Specifications following this Section.

B. Notify Engineer at least 3 days prior to start of surface preparation, coating application, and corrosion protection work.

3.07 PLACEMENT OF PIPE LOCATING TAPE

A. Place pipe locating tape in accordance with Section 02320, Trench Backfill.

3.08 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Place pipe bedding and pipe zone material in accordance with Section 02320, Trench Backfill.

3.09 FIELD QUALITY CONTROL – INSPECTION AND TESTING

A. General:

1. Notify Engineer in writing at least 15 days in advance of testing. Perform testing in presence of Engineer.
2. Using water as test medium, all newly installed pipelines shall successfully pass hydrostatic leakage test prior to acceptance.
3. Conduct field hydrostatic test on buried piping after trench has been completely backfilled. Testing may, as approved by Engineer, be done prior to placement of asphaltic concrete or roadway structural section.
4. Contractor may, if field conditions permit and as approved by Engineer, partially backfill trench and leave joints open for inspection and conduct initial service leak test. Final field hydrostatic test shall not, however, be conducted until backfilling has been completed as specified above.
5. Supply of Temporary Water: In accordance with Section 01500, Construction Facilities and Temporary Controls.
6. Install restraint as necessary to prevent movement of pipe and protect adjacent piping or equipment. Make necessary taps in piping prior to testing.
7. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
8. New Piping Connected to Existing Piping: Isolate new piping with grooved-end pipe caps, blind flanges, or other means as acceptable to Engineer.

9. Service connections for water mains are to be installed to the angle stop prior to disinfection and testing of the installed main.
10. Fire hydrant leads are to be installed to the shut-off valve prior to disinfection and testing of the installed main.

B. Tapping Sleeve and Valve:

1. Install mechanically restrained test plug with relief port.
2. Test tapping sleeve and valve prior to performing tap.
   a. Test at 150 psi for 15 minutes.
   b. Successful test will be no visible leakage.
3. Test sleeve and valve together with valve open.

C. Hydrostatic Testing Procedure:

1. Furnish testing equipment, as approved by Engineer, which provides observable and accurate measurements of leakage under specified conditions.
2. Maximum Filling Velocity: 0.25 foot per second calculated based on full area of pipe.
3. Expel air from piping system during filling.
4. Test Pressure: 150 psi as measured at low point of pipeline.
5. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
6. Maintain hydrostatic test pressure continuously for 2 hours minimum, adding makeup water only as necessary to restore test pressure.
7. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.

D. Maximum Allowable Leakage:

$$Q = \frac{LD(P)^{1/2}}{148{,}000}$$

where:

Q = Quality of makeup water, in gallons per hour.
L = Length of pipe section tested, in feet.
D = Nominal diameter of pipe, in inches.
P = Average test pressure during hydrostatic test, in pounds per square inch.

3.10 CLEANING AND DISINFECTION

A. Pipelines shall be kept clean during installation. Following assembly and testing, and prior to disinfection and final acceptance, flush pipelines with water at 2.5 fps minimum flushing velocity until foreign matter is removed.

B. Water shall be obtained from a potable, City source and shall be metered. The City shall be notified at least 2 working days prior to the intended use such that the meter can be installed. The Contractor shall pay the City for all water used. Water cost shall be incidental to the related pipeline installation work items.

C. Flushing shall be accomplished by partially opening and closing valves several times under expected line pressures with velocities adequate to remove foreign materials from the pipe, valves, and hydrants.

D. If impractical to flush large diameter pipe at 2.5 fps, clean pipe by use of pipe pig as approved by Engineer. Multiple passes of pipe pig may be required to adequately clean line.

E. Remove accumulated debris through blowoffs 2 inches and larger or by removing spools and valves from piping. If hydrants are used, they must be adequately flushed and cleaned prior to being put into service.

F. Disinfection of Water Mains: As specified in Section 02519, Disinfection of Water Systems.

3.11 ABANDONMENT OF WATER MAINS

A. Water mains, 8 inches and less, being replaced shall be abandoned in-place.

B. When new mains have been tested, approved, and services relocated, cut, cap, and restrain any connections to remaining pressurized mains.

3.12 REPAIR OF DAMAGED PIPING

A. All existing piping damaged by the Contractor as a result of construction activities shall be repaired by the Contractor.

1. The Utilities Department shall be notified of all water main and force main damage and for all control valve operation.
2. Damage to unmarked mains shall be considered additional work or will be repaired by the Owner.
3. Damage to marked mains shall be repaired at no additional cost to the Owner.

B. Cleaning and disinfection of water main repairs shall be in accordance with the provisions of Section 02519, Disinfection of Water Systems.

C. If the Owner is required to make repairs for damaged mains that are the responsibility of the Contractor, the cost of the work will be charged to the Contractor.

END OF SECTION

PROJECT 12089

SECTION 02502
DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUBMITTALS

A. Quality Control Submittals:

1. Manufacturer's Certificate of Compliance, in accordance with Section 01640, Manufacturers' Services, stating that inspections and specified tests have been made and that results thereby comply with requirements of Article Source Quality Control.
2. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at a minimum, include the following:
   a. Testing dates.
   b. Piping systems and section(s) to be tested.
   c. Method of isolation.
   d. Method of conveying water from source to the system being tested.
   e. Calculation of maximum allowable leakage for the piping section(s) to be tested.
3. Certifications of Calibration: Approved testing laboratory certificate if pressure gauge for the hydrostatic test has been previously used. If the pressure gauge is new, no certificate is required.
4. Test documentation form and results.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe:

1. General:
   a. Centrifugally cast, grade 60-42-10 iron, minimum 350 psi working pressure for pipes 12 inches and less, minimum 250 psi working pressure for pipes 14 inches and greater.
   b. Meet requirements of AWWA C151, C110, C153, and C111.
   c. Lined and coated as specified.
2. Pressure rating of pipe to be specified according to the particular requirements of the Project.
3. Pipe wall thickness of threaded pipe for a flanged pipe end shall be minimum special thickness Class 53 from 4-inches to 54-inches and/or minimum pressure Class 350 for 60-inches to 64-inch diameter pipe in accordance with AWWA C115.
4. Grooved end pipe, for all pipe diameters, shall be minimum Special Class 53.
5. Pipe shall be new and recently manufactured. Refurbished pipe shall not be provided.

B. Joints:

1. Push-On Joint: Rated at a minimum working pressure equal to pipe material design.
2. Restrained Joint:
   a. The manufactured proprietary joint that mechanically restrains pipe to adjoining pipe.
   b. Manufacturers and Products:
      1) U.S. Pipe; TR Flex, Restrained Tyton, and Field-Lok.
      2) American Cast Iron Pipe; Flex-Ring, Lok-Ring, and Fast-Grip.
      3) One bolt fittings as manufactured by One Bolt, Inc., for restrained fittings 12 inches in diameter and less.
   c. Use of restraining gaskets for planned joint restraint is restricted to pipes 12 inches in diameter or less.
3. Mechanical Wedge Action Type Joint: Use only in areas where adjoining to fixed points where laying length is determined in the field. Prior to purchase and installation, type and application of this joint shall be approved by ENGINEER. Use of mechanical joint restraint or field-restraining type gaskets in excess of 12 inches shall not be allowed, unless an unexpected field condition requires cutting the pipe and installation of a field applied restraint. Use of set screws to provide restraint of any kind is not permitted.
   a. Manufacturers and Products:
      1) Meg-a-lug, as manufactured by EBBA Iron.
      2) Stargrip, as manufactured by Star Pipe Products.
      3) Grip-ring, as manufactured by Romac.
4. Flanged Joint: Threaded 250 psi working pressure ductile iron flanges conforming to AWWA C115 for Class 125 flanges.
5. Grooved Joint:
   a. Rigid and/or Flexible type radius cut grooved, conforming to AWWA C606, depending on the particular application.
   b. As manufactured by Victaulic Company of America.

C. Fittings:

1. Ductile Iron, Push-On, Flanged or Restrained Joint: In accordance with AWWA C110 or C153; 250 psi minimum working pressure for 4- to 24-inch fittings and 250 psi minimum working pressure for 24- to 64-inch fittings and AWWA C111.
2. Mechanical Joint Fittings: In accordance with AWWA C111.
3. Grooved End Fittings:
   a. Radius cut grooved, rigid and/or flexible type conforming to AWWA C110 and/or AWWA C153 as above.
   b. Manufacturers:
      1) Victaulic Company of America.
      2) Gustin-Bacon.
4. Fittings shall be new and recently manufactured. Refurbished fittings will not be accepted.

D. Welded Outlet: the Only weld to pipe in the manufacturer's shop – may be used in lieu of a tee where economical and where subject to manufacturer's limitations.

E. Lining:

1. Pipe and fittings for clean water applications shall be cement lined and asphaltic seal coated in accordance with AWWA C104.
2. Pipe and fittings for wastewater applications shall be lined with 40-mils Protecto 401 ceramic epoxy, or equivalent.

F. Coating:

1. Buried Pipe: Asphaltic coating, 1 mil thick, in accordance with AWWA C151, C115, C110, and C153.
2. Exposed Pipe: Coal-tar epoxy, 2 coats, 16 mils thick, primed in accordance with the manufacturer's recommendations and surface prepared to SP 5-91 (SSPC standards).

G. Polyethylene Encasement:

1. All buried ductile iron pipe and fittings shall be encased, unless otherwise indicated.
2. Virgin polyethylene raw material conforming to requirements of ASTM D4976.
3. Elongation: 800 percent, minimum in machine and transverse direction (ASTM D882).
4. Tensile Strength: 3,600 psi, minimum.
5. Dielectric Strength: 800V/mil-thickness, minimum.
6. Propagation Tear Resistance: 2,550 gf, minimum in the machine and transverse direction (ASTM 1922).
7. Tube form, conforming to AWWA C105.
8. Film shall have a minimum in thickness of 0.008 in (8 mil).

H. Bolting:

1. Bolts for flanged connections shall be carbon steel, ASTM A307, Grade A hex bolts, and ASTM A563, Grade A hex head nuts.
2. Bolts for grooved end connections shall be manufacturer's standard.

I. Gaskets:

1. Gaskets for flat faced 150 and 250 psi working pressure flanges shall be 1/8-inch thick, red rubber (SBR), hardness 80 (Shore A), rated to 200 degrees F, conforming to ANSI B16.21, AWWA C207, and ASTM D1330, Grades 1 and 2.
2. Gaskets for grooved end joints shall be Halogenated butyl, conforming to ASTM D2000 and AWWA C606.
3. Tor-seal or equal gaskets shall be used for exposed, flanged joints.

J. Pressure Test Gauges:

1. Heavy duty industrial quality gauges.
2. Oil-filled.

2.2 SOURCE QUALITY CONTROL

A. Factory Tests: In accordance with AWWA C104, C105, C110, C111, C115, C150, C151, C153, or C606, as required by the particular Project application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect pipe and fittings to ensure no cracked, broken, or otherwise defective materials are being used.

3.2 INSTALLATION

A. In accordance with AWWA C605, ASTM D2321, and AWWA Manual 23, Section 02500, Conveyance Piping – General, and Section 02320, Trench Backfill.

B. Field Welding:

1. Use of field welded outlets will not be allowed. Welding for outlets shall be performed only in a pipe manufacturer's shop.
2. Field installed outlets may be installed with saddle approved by Engineer. Opening in pipe shall be machined cut and not with cutting torch.
3. Field welding of bars for restrained joint systems will not be allowed. All welding shall be performed in the pipe manufacturer's shop.

C. Polyethylene Encasement:

1. Encase pipe, fittings, and valves were specified in accordance with AWWA C105, Method A.
2. Cut polyethylene tube approximately 2 feet longer than pipe length.
3. Slip tube around the pipe, centering to provide 1-foot overlap on each adjacent section.
4. Pull encasement to take out slack and wrap snug around the pipe.
5. Secure overlap in place and fold at quarter points of pipe length.
6. Wrap and tape encasement snug around fittings and valves.

3.3 TESTING AND INSPECTION

A. In accordance with the provisions of Section 02500, Conveyance Piping-General.

END OF SECTION

PROJECT 12089

SECTION 02509
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

PART 1 GENERAL

1.01 DELIVERY, STORAGE, AND HANDLING

A. Solvent Cement: Store in accordance with ASTM D2855.

B. In general PVC pipe will be used for small diameter (4-8 inch) water distribution piping.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe:

1. All PVC pressure pipe shall be C-900, minimum SDR-18 with a minimum pressure rating of 150 psi, conforming to requirements of AWWA C900 and AWWA C905.
2. Dimension Ratio (DR) shall be in accordance with the particular application and as shown on Drawings.
3. Pipe to be used for potable water conveyance shall be manufactured from National Sanitation Foundation (NSF) approved compounds.
4. Pipe to be used for force mains shall be the color green, and pipes to be used for water mains shall be the color blue or have continuous blue stripes parallel to the pipe axis located at 90-degree intervals around the pipe.
5. All PVC pipe shall have a No. 6, a single strand, a copper wire placed on top of the pipe. The wire shall be electrically continuous over the length of the pipe and fastened every 10 feet with a No.12 copper wire.

B. Joints:

1. Rubber gasket.
2. Conform to AWWA C900, AWWA C905, and ASTM D3139.

C. Fittings: PVC or DI, as recommended by the pipe manufacturer. DI fittings shall conform with the requirements of Section 2502, Ductile Iron Pipe and Fittings.

D. Service Saddles:

1. Double strap type with minimum strap width of 2 inches.
2. Straps shall be Type 304 stainless steel. Saddles shall be ductile iron, epoxy-coated, 10 mils minimum thickness.

E. Restrained Joints: Pipe restraint, where indicated on Drawings, shall be provided by the system using wedges or gripping teeth or by integral pipe system restraint. The system shall be specifically recommended for use on PVC pipe. Systems with set screws shall not be used.

1. Restraint is required at all valves and fittings and for additional pipe length as shown on the Drawings.
2. Manufacturer and Products:
   a. EBBA Meg-a-lug.
   b. Star Pipe Products Stargrip.
   c. Romac Grip-Ring.
   d. CertainTeed style restrained joints where available for the size of pipe.
   e. Solvent welded joints as appropriate and as shown on the Drawings.
   f. Or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with AWWA C605, ASTM D2321, and AWWA Manual 23, the Uni-Bell Plastic Pipe Association PVC Pipe Manual, Section 02500, Conveyance Piping – General, and Section 02320, Trench Backfill.

B. Solvent cement used for joints as recommended by pipe manufacturer.

C. Joints:

1. Rubber Gasketed: In accordance with manufacturer's written instructions.
2. Solvent Cemented: In accordance with ASTM D2855.
3. Restrained Joint Systems: In accordance with manufacturer's written instructions.

D. Pipe Bending for Horizontal or Vertical Curves:

1. The radius of curves shall not exceed 75 percent of manufacturer's recommended values.
2. Use blocks or braces at pipe joints to ensure axial deflection in the gasket or mechanical joints does not exceed allowable deflection.

E. Maximum Joint Deflection: 75 percent of manufacturer's recommended values.

3.02 INSPECTION AND HYDROSTATIC TESTING

A. In accordance with the provisions of Section 02500, Conveyance Piping - General.

END OF SECTION

PROJECT 12089

SECTION 02632
STORM DRAIN AND SANITARY SEWER PIPING

PART 1 GENERAL

1.1 DELIVERY, STORAGE, AND HANDLING

A. The storage of pipe at the Project site shall be done in accordance with pipe manufacturer's recommendations and with the approval of the ENGINEER.

B. Marking at Plant: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer's identification, specification standard, diameter of pipe, pipe class, and other information required for type of pipe

C. Pipe, specials, and fittings received at Project site in damaged condition will not be accepted.

D. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage pipe. This includes storage area and along pipe trench.

E. Gasket Storage: Store rubber gaskets in cool, well-ventilated place and do not expose to direct rays of sun. Do not allow contact with oils, fuels, petroleum, or solvents.

F. Handling:

1. Pipe shall be protected during handling against impact, shock, and falling.
2. Heavy canvas, or nylon slings of suitable strength shall be used for lifting and supporting materials. Do not use chains or cables.
3. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to workmen. Slings shall bear uniformly against pipe.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. As specified on the Data Sheets located at the end of this Section as a supplement. C-900 PVC pipe as specified in Section 02500, CONVEYANCE PIPING – GENERAL, may be substituted for the PVC pipe specified in this Section.

B. Damaged storm drain piping shall be replaced with the same size piping using materials as specified in this Section.

2.2 JOINTS

A. As specified on the Data Sheets located at the end of this Section as a supplement.

2.3 SERVICE AND DRAIN CONNECTIONS

A. Pipe and fittings for individual service connection shall be of one type of material throughout. No interchanging of pipe and fittings allowed. Long-radius bends shall be used for changes in directions, unless approved otherwise by ENGINEER.

B. All sewer service connections shall be PVC.

C. Residential Service: 6 inch.

D. Commercial Service, Including Motel and Apartments: 6 inch, unless shown otherwise.

E. Cleanouts and Covers:

1. PVC for non-traffic areas as shown on the Drawings.
2. No cleanouts are to be installed in the sidewalk, unless approved by the ENGINEER.
3. Cast iron valve box and cover required for installation in driveways, sidewalks, swales or traffic areas, USF 7615 (FC); or equal.

2.4 CLOSED CIRCUIT TELEVISION (CCTV) EQUIPMENT

A. The CCTV camera with rotating lens or pan and tilt 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 inches to the entire inside periphery of the sewer pipe. The camera shall have a minimum resolution capability of 350 lines per inch. The camera shall record in VHS T 120 format. Do not use long play as quality is not acceptable.

B. Color television monitors shall be provided. Monitors shall have a resolution capability of no less than 350 lines per inch. 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.

C. A Polaroid type camera shall be available for making still photos for reproduction.

D. CCTV inspection of sewers to be horizontally is required prior to excavation to verify lateral locations.

2.5 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Granular material as specified in Section 02320, TRENCH BACKFILL.

PART 3 EXECUTION

3.1 GENERAL

A. Notify ENGINEER at least 2 weeks prior to field fabrication of pipe or fittings.

B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of pipe furnished.

C. Distributing Materials: Place materials along trench only as will be used each day, unless otherwise approved by ENGINEER. Placement of materials shall not be hazardous to traffic or to general public, obstruct access to adjacent property, or obstruct others working in area.

3.2 PREDIGGING AND RELOCATIONS OF WATER MAIN

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 on the drawings 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 pre-digging 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 or DI pipe, depending on the existing material.

1. The complete installation shall have all restrained joints including the connections to the existing pipe.
2. The installation shall be cleaned and disinfected in accordance with the provisions of Section 02519, DISINFECTION OF WATER SYSTEMS.

E. The CONTRACTOR may request a pre-dig 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 pre-dig, 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 pre-dig, but the actual information reveals to the ENGINEER that the water main should not be relocated, payment will be made only for the pre-digging.

H. Only water mains 2 inches and larger shall be considered for payment. Water mains and services 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.

3.3 EXAMINATION

A. Verify size, material, joint types, elevation and horizontal location of existing pipeline to be connected to new pipeline or new equipment.

B. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with manufacturer's instructions.

C. Repairs to Reinforced Concrete Pipe section will be allowed, only if approved in writing by ENGINEER. Damaged pipe which, in opinion of ENGINEER, cannot be repaired, will be rejected and removed from the Project site.

3.4 EXCAVATION

A. Excavate pipe trenches as specified in Section 02316, EXCAVATION.

B. The amount of trench length permitted to be open at one time shall not extend more than 400 feet of the pipe laying operations, unless approved by the ENGINEER.

C. Place and compact bedding material as specified in Section 02320, TRENCH BACKFILL.

3.5 PIPE PREPARATION AND HANDLING

A. Pipe Distribution: Do not distribute more than 1 week's supply of materials in advance of laying, unless otherwise approved by ENGINEER.

B. Inspect all pipe and fittings prior to lowering into trench to ensure no cracks, broken, or otherwise defective materials are being used.

C. Clean ends of pipe thoroughly. Remove foreign material and dirt from inside of pipe and keep clean during and after laying.

D. Use proper implements, tools, and facilities for the safe and proper protection of the work.

E. 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.

3.6 INSTALLATION OF PIPE, FITTINGS, AND APPURTENANCES

A. General:

1. Keep trench dry until pipe laying and joining are completed. Take precautions to prevent “uplift” or floating of pipe prior to completion of backfill operation. If the excavation cannot be effectively dewatered the CONTRACTOR shall propose alternate pipe installation methodology for approval by the ENGINEER prior to proceeding. All requirements of Section 02320, TRENCH BACKFILL, will remain in effect.
2. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow.
3. When field cutting or machining pipe is necessary, use only tools and methods recommended by pipe manufacturer and approved by ENGINEER.
4. Excavate bell holes at each joint to permit correct assembly and inspection of entire joint.
5. Pipe shall be laid accurately to line and grade. Establish line and grade for pipe by use of lasers. Check for alignment and grade after joint has been made.
6. Measure for grade at pipe invert, not at top of pipe.
7. Pipe invert may deviate from line or grade up to 1/2 inch for line and 1/4 inch for grade, provided that finished pipe line will present a uniform bore, and such variation does not result in a level or reverse sloping invert, or less than minimum slope shown. As-built information will be collected on a daily basis as provided in Section 01040, COORDINATION. Pipe runs with less than the required slope will be required to be removed and replaced at the CONTRACTOR’S expense.
8. Pipe bedding shall form a continuous and uniform bearing and support for the pipe barrel between joints. Pipe shall not rest directly on the bell or pipe joint.
9. Prevent entry of foreign material into gasketed joints. The presence of debris in the main will require correction.
10. Use gasket lubricant as recommended by gasket manufacturer. Assemble joint in accordance with recommendations of manufacturer.
11. No pipe shall be laid until the two preceding lengths have been thoroughly embedded in-place, so as to prevent moment or disturbance of the pipe.
12. Apply sufficient pressure in making joint to assure that joint is “home” as defined in standard installation instructions provided by pipe manufacturer. Inside joint space shall not exceed 50 percent of pipe manufacturer’s recommended maximum allowance.

13. Whenever the pipe laying is discontinued, as at night, the unfinished end is to be securely protected from displacement by laying of the banks or from other injury, and a suitable stopper is to be inserted into the pipe end to prevent clogging of the pipe.
14. Plug or close off pipes which are stubbed off for manhole, concrete structure, or for connection by others, with temporary watertight plugs.
15. Connections between one pipe material and another shall be by means of flexible compression collar, installed in accordance with the manufacture's recommendations, or concrete closure collar.

B. Connection to Structure or Manhole:

1. Locate standard pipe joint within 1.5 feet outside face of structure for pipe 18 inches and smaller and within one pipe diameter for pipe 21 inches and larger.
2. Connect PVC pipe to manhole or structure with pipe to manhole connector in accordance with manufacturer's recommendations.

C. Crossing Waterlines: Where sanitary sewer crosses less than 18 inches below waterline, use ductile iron or PVC pressure pipe for crossing or encase in concrete envelope for a minimum distance of 9 feet on each side of waterline.

D. Concrete Closure Collars: Only use concrete closure collars where shown or authorized by ENGINEER.

E. Service Connections:

1. Minimum Slope: 1/8-inch per foot.
2. Minimum Trench Depth: 3 feet at property line or on property within permanent sewer easement. ENGINEER will determine required depth at end of line in each case.
3. Progress of Construction: Unless otherwise approved by ENGINEER, install service connections not more than 5 days after backfilling of sewer trench in block or equivalent 400-foot section of sewer.
4. Service Connection Tees or Wyes: Furnish tee or wye outlets with gasketed type joint or approved adapter to join service connection pipe. Concrete encase tees or wyes deeper than 12 feet. Do not encase joints at ends of tee or wye fittings.
5. Disconnecting and Reconnecting Existing Service Connections:
   a. Locate the existing service connections prior to constructing the tee in the new sewer line.
   b. First length of pipe out from tee on lateral or main shall not be greater than 3 feet in length.
   c. 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 ENGINEER.
   d. Disconnect existing service connections from existing sewers to be abandoned and reconnect them to the new sewers.
   e. Make service connection to sewer system at manhole when directed by ENGINEER. Where service connection pipe is connected to

manhole or concrete structure, make connection so standard pipe joint is located not more than 1.5 feet from structure.

3.7 BACKFILLING AND COMPACTION

A. Backfill and compact all pipe trenches as specified in Section 02320, TRENCH BACKFILL.

B. Repair excavations in roadways as specified in Section 02772, ASPHALT CONCRETE PAVEMENT, or Section 02575, SURFACE RESTORATION.

3.8 WORK STOPPAGE

A. If the Work is stopped on the whole or any part of the trench, and the same is left open for an unreasonable length of time in advance of the construction for any reason except delay in removing obstructions over which the CONTRACTOR has no control, the CONTRACTOR shall, when directed, refill such trench or part thereof and temporarily repave over the same with 8-inch rock base and asphalt cold patch at his own cost and expense, and he shall not again open such trench or part thereof until he is ready to proceed with construction.

3.9 SEWER CLEANING AND CCTV INSPECTION

A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by ENGINEER, flush and clean all parts of the 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. Internally inspect pipelines by CCTV after the completion of pipeline cleaning and testing. Conduct inspection in presence of ENGINEER.

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 TV inspection make a video tape recording of each manhole section.
4. Take Polaroid or digital photos of the monitor image as required by the ENGINEER.
5. Plug off manhole at ends of line so no flow enters new sewer pipe except that from service connections.
6. Pull camera at uniform rate, stopping to properly document defects. Maximum pull of camera shall not exceed 30 feet per minute.

C. Provide detailed information on the videotape at each starting manhole and similar information on the sewer logs. At a minimum, provide company name, project name, date of video, street name, manhole number, manhole-to-manhole run, manhole diameter, direction of flow, size of pipe, type of pipe, crew leader

name, OWNERS's inspector's name, lateral location (footage from manhole), and direction (north, south, east, or west).

D. Show sufficient detail to determine cracks in pipe, offset joints, leaking joints, sags and other flaws in pipeline installation. Record location of deficiencies by distance from center of reference manhole.

E. Upon completion, playback tape in presence of ENGINEER. Any tape not meeting quality standard will be rejected and taping process repeated.

F. Correct deficiencies in pipe found as a result of video replay. Replace any sewer pipe which has any deficiencies specified. Grouting of leaky joints or damaged pipe on new sewer pipe will not be accepted. Re-inspect the replaced pipe for deficiencies and replace pipe until no deficiencies exist.

G. Dispose of cleaning water in a manner that will not damage or interfere with adjacent property and in a manner acceptable with ENGINEER and regulatory agencies.

3.10 HYDROSTATIC TEST

A. General:

1. Notify ENGINEER in writing 5 days in advance of testing. Perform testing in presence of ENGINEER.
2. Test sections of constructed sewer between stations only after service connections, manholes, and backfilling have been completed. Testing may be done prior to placement of asphaltic concrete or roadway structural section.
3. Isolate new pipelines that are connected to existing pipelines. Install pipe plugs as required to allow section of new pipe to be pressure tested.
4. Plug wyes, tees, stubs, and service connections with gasketed caps or plugs securely fastened or blocked to withstand internal test pressure. Such plugs or caps shall be removable, and their removal shall provide socket suitable for making flexible jointed lateral connection or extension.
5. Furnish testing equipment and perform tests as approved by ENGINEER. Testing equipment shall provide observable and accurate measurement of leakage under specified conditions.
6. Provide and bear costs of necessary water required for testing project piping.

B. Testing Equipment Accuracy: Plus or minus 1/2-gallon of water leakage under specified conditions.

C. Maximum Allowable Leakage: 0.16 gallons per hour per inch diameter per 100 feet. Include service connection footage in test section, subjected to minimum head specified.

D. Exfiltration Test:

1. Hydrostatic Head:

a. At least 6 feet above maximum estimated groundwater level in section being tested.
b. No less than 6 feet above inside top of highest section of pipe in test section, including service connections.

2. Length of Pipe Tested: Limit length such that pressure on invert of lower end of section does not exceed 30 feet of water column.

E. Infiltration Test:

1. Groundwater Level: At least 5 feet above inside top of highest section of pipe in test section, including service connections.
2. Visible infiltration will require correction.

F. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered *defective* even if pipe previously passed a pressure test.

G. Defective Piping Sections: Replace, and retest as specified.

3.11 LOW PRESSURE AIR TESTING

A. In accordance with ASTM F-1417.

B. General:

1. Notify ENGINEER in writing 5 days in advance of testing. Perform testing in presence of ENGINEER.
2. Test sections of constructed sewer between stations only after service connections, manholes, and backfilling have been completed. Testing may be done prior to placement of asphaltic concrete or roadway structural section.
3. Isolate new pipelines that are connected to existing pipelines. Install pipe plugs as required to allow section of new pipe to be pressure tested.
4. Plug wyes, tees, stubs, and service connections with pneumatic plugs. The plug design shall be such that they will hold against the test pressure without external blocking or bracing. Such plugs shall be removable, and their removal shall provide socket suitable for making flexible jointed lateral connection or extension. One of the plugs shall have 3 air hose connections; one for inflating the plug, one for reading the air pressure and one for introducing air into the sealed line.
5. Furnish testing equipment and perform tests as approved by ENGINEER. Testing equipment shall provide observable and accurate measurement of leakage under specified conditions. Calibrate gauges with standardized test gauge at start of each testing day. Install compressor, air piping manifolds, gauges, and valves at ground surface.
6. Provide pressure release device, such as rupture disc or pressure relief valve, to relieve pressure at 8 psig or less.
7. If the groundwater is higher than the top of the pipe, the test pressure shall be increased by 0.43 psi/foot up to five (5) feet above the top of the pipe. For groundwater in excess of 5 feet above the top of the pipe, infiltration testing shall be conducted.

C. No person shall enter manhole or structure, or occupy area above opening of manhole or structure where pipe is under pressure.

D. Low pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure resulting from any groundwater above the pipe. At least two minutes shall elapse to allow the pressure to stabilize.

E. The time required for the internal pressure to decrease from 3.5 to 2.5 psig greater than the average back pressure shall not be less than the time shown for a given pipe diameter:

Pipe Diameter (in.)	Minimum Elapsed Time (min.)
8	7.5
10	9.25
12	11.25
15	14
18	17

F. Defective Piping Sections: Replace, and retest as specified.

3.12 PVC PIPE DEFLECTION TESTING

A. General:

1. Test installed gravity PVC pipeline by pulling a mandrel through the main without the use of a mechanical pulling device.
2. Perform the test at least 10 days after trench backfill and compaction have been completed.

B. Mandrel:

1. Full circle, solid or rigid legged (9 min) steel cylinder with pulling rings at each end.
2. Sized to allow an ultimate deflection of less than 5 percent minimum size, 96.67 percent if inside pipe diameter.

C. Correcting Deficiencies:

1. Excavate to spring line and replace and re-compact pipe zone material.
2. Internal pipe re-rounding or vibration will not be permitted.
3. If pipe does not past mandrel test following (1), replace pipe section.

3.13 INTERNAL INSPECTION (LAMPING)

A. Notifications:

1. Notify ENGINEER:
   a. If depth of flow in pipeline exceeds 50 percent of pipe diameter.

b. If conditions for lamping activities are found to be unsafe or impractical.

B. Inspection Equipment:

1. Allows inspection from surface.
2. Equip with:
   a. Belt-mounted, rechargeable battery and control.
   b. Telescoping Pole: 18 feet long, maximum.
   c. Flood lamps.

C. ENGINEER will be present during initial inspections to establish quality guidelines. All lamping shall be conducted in the presence of an OWNER's Representative.

D. Prevent unnecessary disruption of traffic and access to residences or businesses.

E. Provide one person, in addition to physical inspection crew, to work from surface only.

F. Record defects that are visible from manhole.

3.14 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Data Sheets.

Number	Title
-03	Polyvinyl Chloride (PVC)
-05	Reinforced Concrete

END OF SECTION

SECTION 02632-03 POLYVINYL CHLORIDE (PVC)	
Item	**Description**
Pipe: 15-inch diameter and under	ASTM D3034: Standard dimension ratio less than 26, except that the cell classification shall be 12454-B or 12454-C as defined in ASTM D1784.
Pipe: 18 through a 24-inch diameter	ASTM F679: Standard dimension ratio less than 18, except that the cell classification shall be 12454-C as defined in ASTM D1784.
Ribbed Profile Pipe: 18- through a 36-inch diameter	ASTM F794: Minimum stiffness of 46 psi when tested in accordance with ASTM D2412, except that the cell classification shall be 12454-C as defined in ASTM D1784.
Joints	ASTM D3212 rubber gasketed.
Gaskets	ASTM F477. Lubricants: As approved by the manufacturer.
Fittings	PVC, gasketed. Provide plug when service piping is not required.
Plugs	Removable. Removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.
Source Quality Control Testing	In accordance with specified ASTM.

END OF SECTION

DRAWING INDEX

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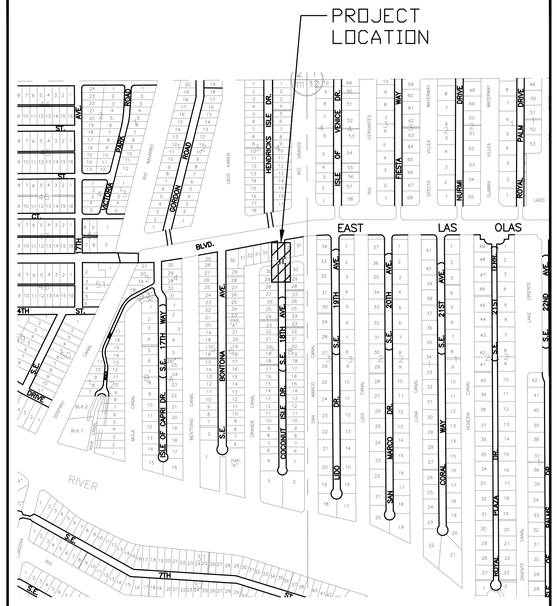
CITY OF FORT LAUDERDALE

PROJECT #12089
COCONUT ISLE
BRIDGE REPLACEMENT

COCONUT ISLE DRIVE OVER GRANDE CANAL
FORT LAUDERDALE, FLORIDA

BRIDGE NO. 865732

Hardesty & Hanover
1000 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119



NORTH

LOCATION SKETCH

PROJECT #12089
COCONUT ISLE
BRIDGE REPLACEMENT
COCONUT ISLE DRIVE OVER GRANDE CANAL

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

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RONALD SANCHEZ, P.E.	CONSULTANT PROJECT MANAGER	(954) 835-9119

DATE: 09/27/18

CAD FILE: 12089-000-036COVR

DRAWING FILE No.: 4-139-62

BIDDING

PAY ITEMS			
ITEM NO.	ITEM	UNIT	QUANTITY
101–1	MOBILIZATION	LS	1
102–1	MAINTENANCE OF TRAFFIC	LS	1
413–149	PENETRANT SEALER	LS	1
630–2–16	CONDUIT, FURNISH & INSTALL, EMBEDDED–RAILINGS	LF	95
1080–14	UTILITY FIXTURES, RELOCATE	LS	1
	STRUCTURES		
110–3	REMOVAL OF EXISTING STRUCTURES	SF	3,512
110–73	REMOVAL OF EXISTING BULKHEAD	LF	135
400–148	PLAIN NEOPRENE BEARING PADS	CF	1.22
400–2–10	CONCRETE CLASS II, APPROACH SLABS	CY	74.5
400–4–4	CONCRETE CLASS IV, SUPERSTRUCTURE DECK	CY	43.2
400–4–5	CONCRETE CLASS IV, SUPERSTRUCTURE BENT CAP	CY	35.8
400–4–6	CONCRETE CLASS IV, SEAWALL CAP	CY	20.7
400–7	BRIDGE DECK GROOVING, DECK THICKNESS LESS THAN 8.5"	SY	223
415–1–4	REINFORCING STEEL, SUPERSTRUCTURE DECK	LB	5,781
415–1–5	REINFORCING STEEL, SUPERSTRUCTURE BENT CAP	LB	10,907
415–1–6	REINFORCING STEEL, SEAWALL CAP	LB	3,355
415–1–9	REINFORCING STEEL, APPROACH SLAB	LB	11,533
450–3–91	PRESTRESSED SLABS UNITS, VARIABLE WIDTH 30–47", THICKNESS 12"	LF	376
455–14–3	CONCRETE SHEET PILING, 10"X30"	LF	1,391
455–34–3	PRESTRESSED CONCRETE PILE 18" SQ.	LF	402
455–143–3	TEST PILES	LF	160
458–1–11	POURED EXPANSION JOINT WITH BACKER ROD	LF	78
460–2–15	TEMPORARY SUPPORT	LF	1
521–5	CONCRETE TRAFFIC BARRIER	LF	104
	ROADWAY		
104–11	FLOATING TURBIDITY BARRIER	LF	120
108–2	MONITOR EXISTING STRUCTURES	LS	1
120–9	SOIL COMPACTION	SY	165
121–70	FLOWABLE FILL	CY	300
160–4	STABILIZATION, 4" OPTIONAL BASE GROUP 1 (TYPE B12.5 ONLY)	SY	305
162–1–11	PREPARED SOIL LAYER	SY	126
334–1–12	TYPE FC 12.5 FRICTION COURSE (TRAFFIC A) (1.5")	TN	18.4
455–133	SHEET PILING	SF	800
570–1–1	PERFORMANCE TURF	SY	126
327–70	MILLING EXISTING PAVEMENT	SY	165

PAY ITEM NOTES:

1. INCLUDE THE COST OF SIGN RELOCATION UNDER PAY ITEM NO. 102–1 MAINTENANCE OF TRAFFIC.
2. INCLUDE THE COST OF UTILITY HANGERS UNDER PAY ITEM NO. 1080–14 UTILITY FIXTURES, RELOCATE.
3. INCLUDE THE COST OF COUPLINGS AND JUNCTION BOXES UNDER PAY ITEM NO. 400–4–4 CONCRETE CLASS IV, SUPERSTRUCTURE DECK.
4. INCLUDE THE COST OF CLASS 5 COATING UNDER PAY ITEM NO. 400–4–4 CONCRETE CLASS IV SUPERSTRUCTURE DECK.
5. INCLUDE THE COST OF TEMPORARY SUPPORT (PILES, STEEL PLATES AND CHANNELS, ANCHOR RODS, GROUT, ETC.) IN PAY ITEM NO. 460–2–15 TEMPORARY SUPPORT.
6. INCLUDE THE COST OF SEWER AND WATER SUPPORT BRACKET AND SPECIALTY ENGINEERING FOR SAME UNDER PAY ITEM NO. 1080–14.
7. INCLUDE THE COST OF CONCRETE AND REINFORCEMENT FOR CONCRETE BARRIER UNDER PAY ITEM NO. 521–5 CONCRETE TRAFFIC BARRIER.
8. INCLUDE THE COST OF TEMPORARY K BARRIERS UNDER PAY ITEM NO. 102–1 MAINTENANCE OF TRAFFIC.
9. INCLUDE THE COST OF WORK ZONE SIGNS, CHANNELIZING DEVICES, TRAFFIC SIGNALS, BARRICADES, STOP BARS, FLAGGERS, PORTABLE SIGNALS, LANE IDENTIFICATIONS UNDER PAY ITEM NO. 102–1 MAINTENANCE OF TRAFFIC.
10. INCLUDE THE COST OF NEW WATER VALVES AND NEW SANITARY SEWER SLEEVES UNDER PAY ITEM NO. 1080–14.
11. SEE NOTE 1 SHEET S02.

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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SUMMARY OF PAY ITEMS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. G01 OF 10
TOTAL: 32
CAD FILE: 12089–G01–SUMM
DRAWING FILE NO. 4–139–62

1. DESIGN SPECIFICATIONS:
   FDOT STRUCTURES MANUAL (JANUARY 2018) AND ALL SUBSEQUENT STRUCTURES DESIGN BULLETINS.
   AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO). LRFD BRIDGE DESIGN SPECIFICATIONS (7TH EDITION) AND ALL SUBSEQUENT INTERIMS.
   FDOT PLANS PREPARATION MANUAL (JANUARY 2016).

2. CONSTRUCTION SPECIFICATIONS:

   FDOT 2018 DESIGN STANDARDS (TOPIC NO. 625-010-003).
   FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, JULY 2018.

3. VERTICAL DATUM:
   B.M. DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.

4. ENVIRONMENT:
   SUPERSTRUCTURE – EXTREMELY AGGRESSIVE
   SUBSTRUCTURE – EXTREMELY AGGRESSIVE

5. DESIGN METHODOLOGY:
   LOAD AND RESISTANCE FACTOR DESIGN USING STRENGTH, SERVICE, EXTREME EVENT AND FATIGUE LIMIT STATES.

6. DESIGN LOADINGS:
   DEAD LOADS: THE FOLLOWING UNIT LOADS ARE USED IN CALCULATING DEAD LOADS:
   REINFORCED CONCRETE – 150 PCF
   FUTURE WEARING SURFACE – 15 PSF
   LIVE LOADS: HL-93, AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
   PEDESTRIAN LIVE LOAD: 375 PLF
   WIND LOAD: AS PER AASHTO LRFD HIGHWAY BRIDGE DESIGN SPECIFICATIONS AND FDOT STRUCTURES DESIGN GUIDELINES.
   WAVE LOAD: N/A
   CONSTRUCTION LIVE LOAD: 20 PSF EXTENDED OVER THE ENTIRE BRIDGE

7. MATERIALS
   A. CONCRETE

CONCRETE CLASS CONCRETE STRENGTH	MIN 28-DAY COMPRESSIVE IN STRUCTURE	LOCATION OF CONCRETE
II	f'c = 4.5 ksi	APPROACH SLAB
IV	f'c = 5.5 ksi	DECK SLABS, BENT CAPS, SEAWALL CAPS, TRAFFIC BARRIER
V (SPECIAL)	f'c = 6.0 ksi	PRESTRESSED PILES
VI	f'c = 8.5 ksi	PRESTRESSED SLABS

   B. CORROSION PROTECTION REQUIREMENTS
   SILICA FUME IS REQUIRED IN THE FOLLOWING CONCRETE COMPONENTS IN ACCORDANCE WITH FDOT SPECIFICATION 346-2.3; SEAWALL SHEET PILES, PRESTRESSED DECK SLABS, SEAWALL CAPS, END BENT CAPS.

8. CONCRETE COVER:

CAST-IN-PLACE SUPERSTRUCTURE (TOP OF DECK)	2"
CAST-IN-PLACE SUPERSTRUCTURE (EXCEPT TOP OF DECK)	2"
CAST-IN-PLACE SUPERSTRUCTURE (CAST AGAINST EARTH)	4"
CAST-IN-PLACE SUPERSTRUCTURE (FORMED SURFACES)	4"

   CONCRETE COVER DIMENSIONS SHOWN IN THE PLANS DO NOT INCLUDE PLACEMENT AND FABRICATION TOLERANCES UNLESS SHOWN AS "MINIMUM COVER". SEE FDOT STANDARD SPECIFICATION 415 FOR ALLOWABLE TOLERANCES. ALL DIMENSIONS PERTAINING TO THE LOCATION OF REINFORCING STEEL ARE TO CENTERLINE OF BAR EXCEPT WHERE CLEAR DIMENSION IS NOTED TO FACE OF CONCRETE.

   CONCRETE EDGES: ¾" CHAMFERS UNLESS OTHERWISE NOTED.

9. APPLIED FINISH COATING:
   APPLY CLASS 5 FINISH COATING TO BRIDGE FACIAS, RAIL, AND SIDEWALK WITH THEIR RESPECTIVE FEDERAL STANDARD 595 SPECIFICATION COLORS. SUBMIT COLORS FOR APPROVAL.

10. CLASS 4 FINISH:
    FINISH BRIDGE DECKS IN ACCORDANCE WITH THE "SHORT BRIDGE" CRITERIA OUTLINED IN SECTION 400-15.2.5.1 OF THE FDOT STANDARD SPECIFICATIONS.

11. UNDERDECK SEALING:
    APPLY DECK SEALANT MEETING REQUIREMENTS OF SECTION 413 OF THE FDOT STANDARD SPECIFICATIONS TO ALL APPROACH SPAN DECK UNDERSIDE.

12. SCREEDING DECK SLABS:
    SCREED THE RIDING SURFACE OF THE BRIDGE DECK AND APPROACH SLABS TO ACHIEVE THE FINISH GRADE ELEVATIONS SHOWN IN THE PLANS. ACCOUNT FOR THEORETICAL DEFLECTIONS DUE TO SELF-WEIGHT, DECK CASTING SEQUENCE, CONSTRUCTION LOADS, OVERLAYS AND TEMPORARY SHORING, ETC. AS REQUIRED.

13. JOINTS IN CONCRETE:
    CONSTRUCTION JOINTS WILL BE PERMITTED ONLY AT THE LOCATIONS INDICATED IN THE PLANS. ADDITIONAL CONSTRUCTION JOINTS OR ALTERATIONS TO THOSE SHOWN SHALL REQUIRE APPROVAL OF THE ENGINEER OF RECORD.

14. REINFORCING STEEL:
    ALL REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.

15. TEMPORARY STRUCTURAL STEEL:
    ALL STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ASTM A709, GRADE 50 UNLESS OTHERWISE SHOWN. ALL STRUCTURAL TUBING SHALL BE ASTM A500, GRADE B.
    S.S. DENOTES STAINLESS STEEL. ALL STAINLESS STEEL SHALL BE ASTM A276 TYPE 316, UNLESS OTHERWISE NOTED.

    FIELD CONNECTIONS:
    FIELD SPLICES, EXCLUDING BOLTED FIELD SPLICES SHOWN IN THE PLANS, WILL NOT BE ALLOWED EXCEPT WITH THE WRITTEN PERMISSION OF THE ENGINEER PRIOR TO THE SUBMISSION OF SHOP DRAWINGS. IF ALLOWED, THESE SPLICES SHALL BE DESIGNED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. THE COST OF THESE SPLICES, INCLUDING THE COST OF DESIGNING, SHALL BE AT NO COST TO THE CITY.

    STRUCTURAL STEEL CONNECTIONS SHALL USE ASTM F1325 GRADE A325 TYPE 1 HIGH STRENGTH BOLTS COMPLETE WITH NUT AND WASHER(S). USE BEVELED WASHERS ON TAPERED FLANGES. ALL NEW BOLTS SHALL BE 7/8" DIAMETER UNLESS OTHERWISE SPECIFIED IN THE PLANS. DO NOT REUSE PREVIOUSLY TIGHTENED BOLTS. THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE FOR PLATE THICKNESS OF ¾" OR GREATER ADJACENT TO THE NUT. BOLT HEADS SHALL BE ON THE EXTERIOR/EXPOSED FACE OF THE GIRDERS.

16. ANCHOR BOLTS SHALL BE ASTM F1554 GRADE 55. ANCHOR BOLTS SHALL MEET FDOT STANDARD SPECIFICATIONS SECTIONS 416 AND 937. PROVIDE MINIMUM OF 8X (BOLT DIAMETER) FROM CENTER LINE OF DRILLED HOLE TO EDGE OF CONCRETE.

17. PHASING OF WORK: SEE PHASING DRAWINGS

18. POLLUTION CONTROL:
    TURBIDITY BARRIERS ARE REQUIRED. SEE SHEET S02 FOR LOCATIONS OF TURBIDITY BARRIERS.

19. PLAN DIMENSIONS:
    ALL DIMENSIONS IN THESE PLANS ARE MEASURED IN FEET AND INCHES EITHER HORIZONTALLY OR VERTICALLY UNLESS OTHERWISE NOTED.

20. UTILITIES:

BROWARD COUNTY OES – WATER SUPPLY	GREG LOVAGLIO	954-847-2725
COMCAST CABLE	LEONARD MAXWELL-NEWBOLD	954-447-8405
CITY OF FORT LAUDERDALE	CRAIG BARRETT	954-828-5875
FLORIDA POWER & LIGHT	TRACY STERN	800-868-9554
TECO PEOPLES GAS – S.F.	YVONNE GOLDMAN	954-453-0824
AT&T/DISTRIBUTION	OTIS KEEVE	954-723-2540

21. EXISTING BRIDGE PLANS:
    EXISTING BRIDGE PLANS ARE NOT AVAILABLE.

22. EXISTING BRIDGE CONSTRUCTION CONSIDERATIONS: THE DIMENSIONS, ELEVATIONS, AND INTERSECTING ANGLES ARE BASED ON SURVEY DATA AND MAY NOT REPRESENT THE AS-BUILT CONDITIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THIS DATA BEFORE BEGINNING CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

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DRAWN BY:	DATE:
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FIELD BOOK:	

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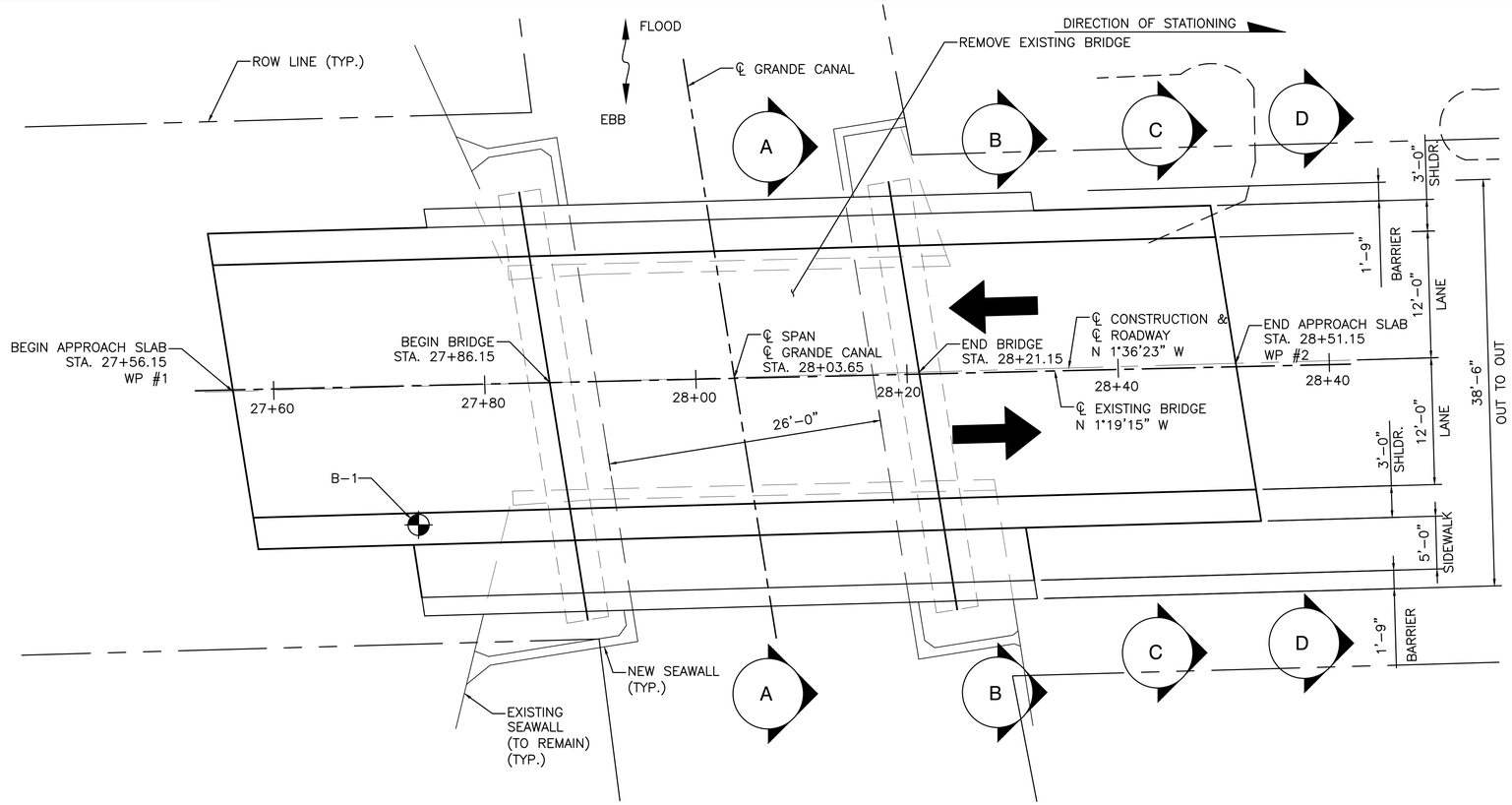
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
GENERAL NOTES
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. G02 OF 10
TOTAL: 32
CAD FILE: 12089-G02-NOTE
DRAWING FILE NO. 4-139-62



PLAN

	COORDINATES
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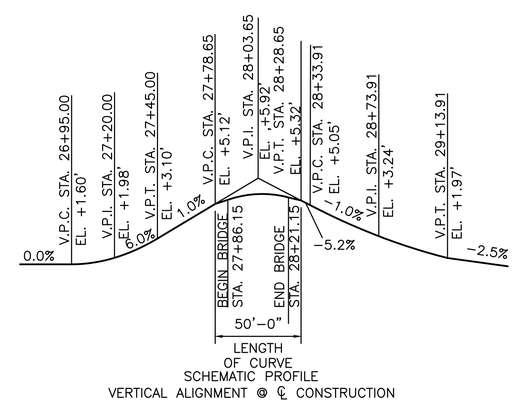
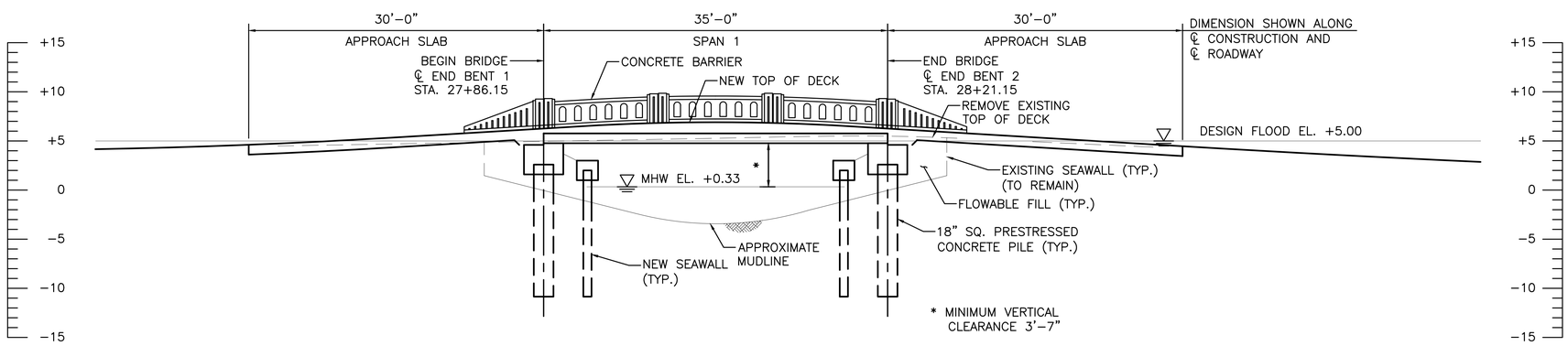
WP #2	STA. 28+51.15
	N: 944354.908 E: 650112.018



LENGTH
OF CURVE
SCHEMATIC PROFILE
VERTICAL ALIGNMENT @ ℄ CONSTRUCTION



ELEVATION

NOTES:

1. FOR RELOCATION OF UTILITIES, SEE UTILITY PHASING PLANS.
2. FOR SECTIONS A-A, B-B, C-C AND D-D, SEE SHEET NOS. G05 AND G06.

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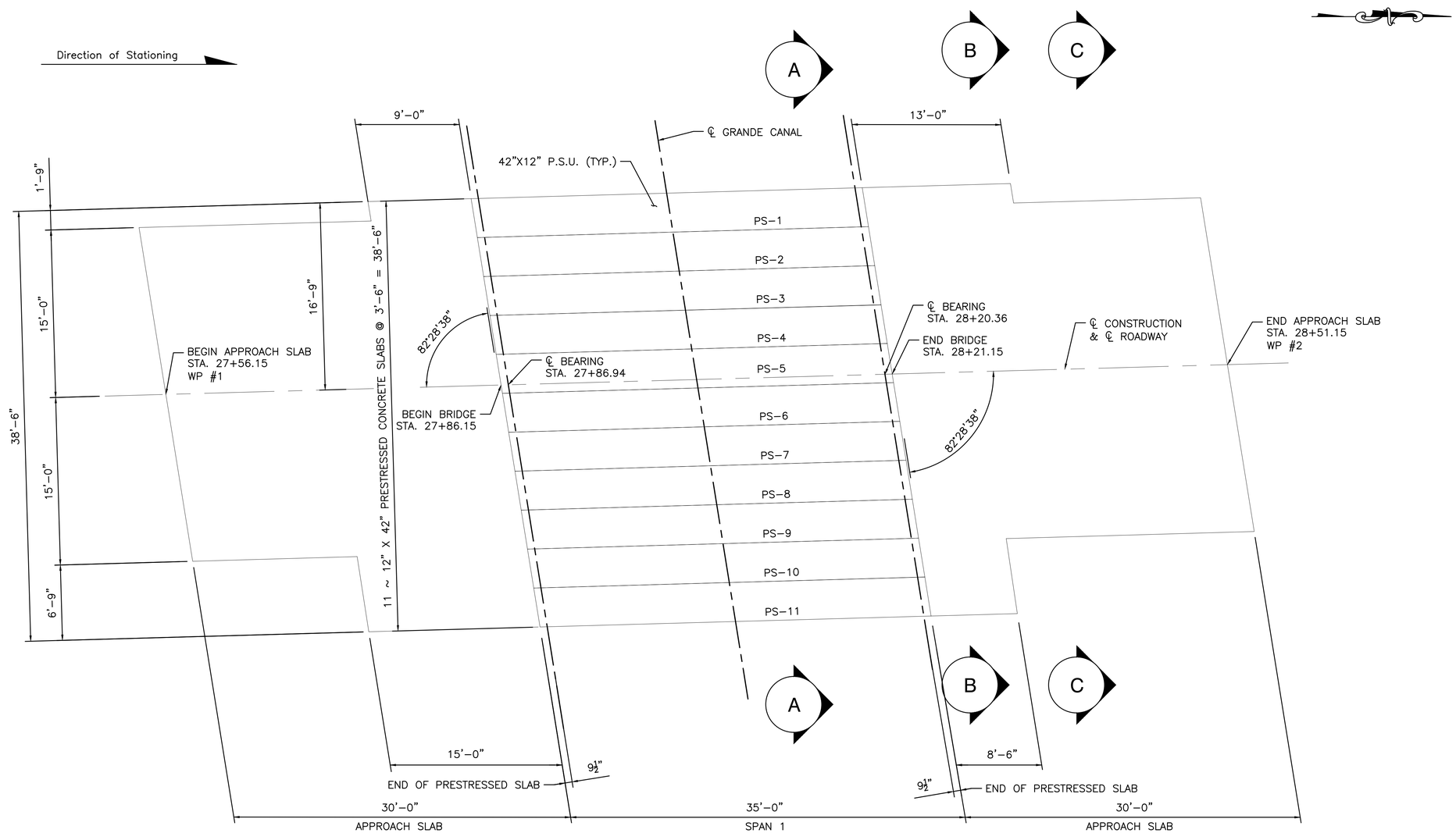
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
GENERAL PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. G03 OF 10
TOTAL: 32
CAD FILE: 12089-G03-PLAN
DRAWING FILE NO. 4-139-62



SUPERSTRUCTURE PLAN

NOTES:

1. FOR SECTIONS A–A, B–B AND C–C, SEE SHEET NOS. G05 AND G06.
2. SEE SHEET NO. G03 FOR WP #1 AND #2 DATA.

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DESIGNED BY:	SCALE:
RS	
CHECKED BY:	
CG	
FIELD BOOK:	

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PUBLIC WORKS DEPARTMENT
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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

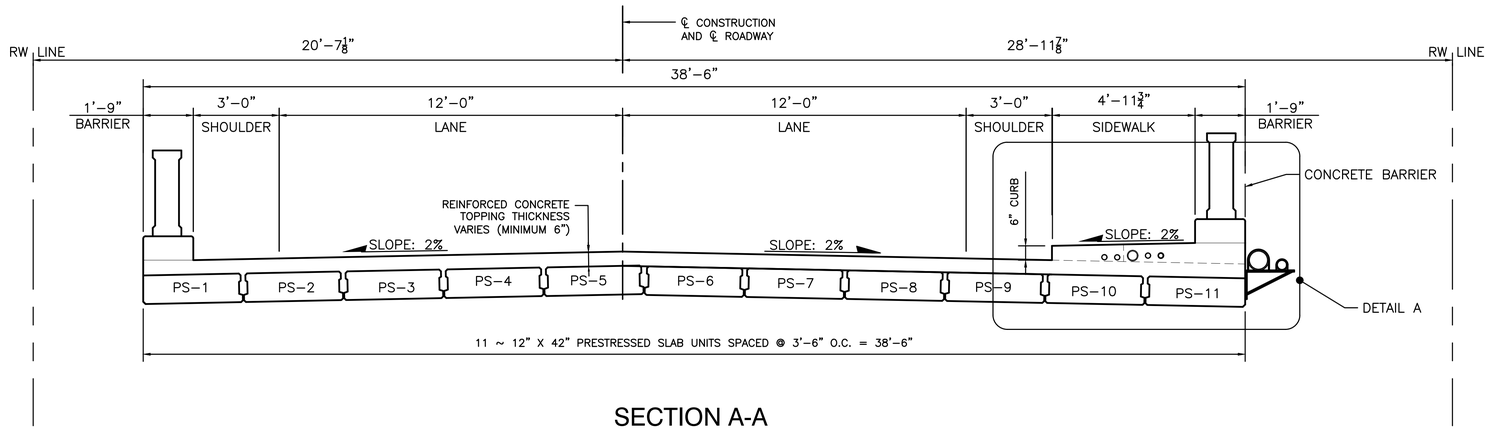
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
STRUCTURE PLAN
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
G04	10

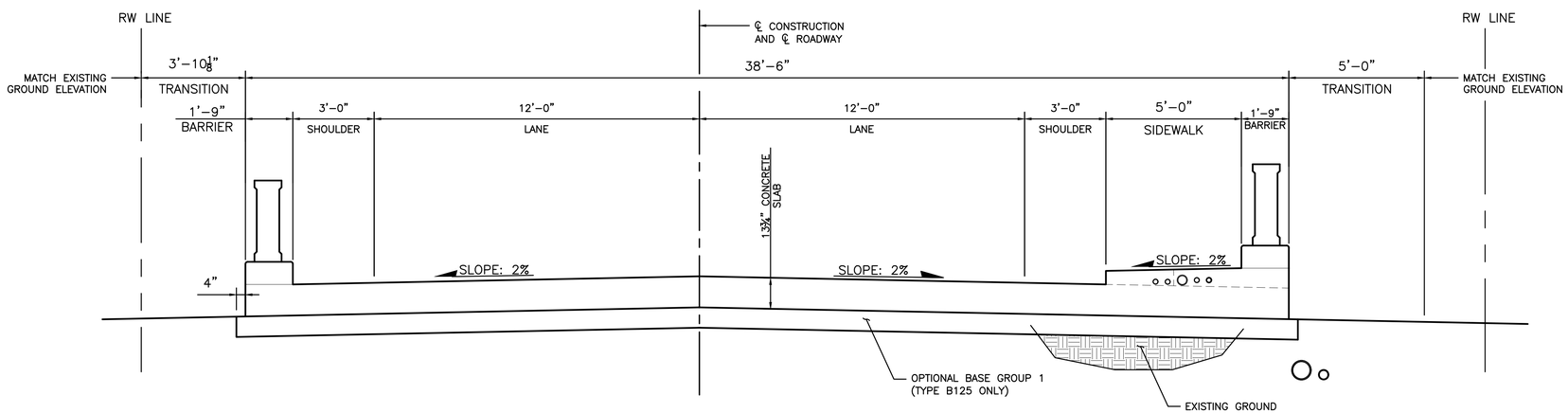
TOTAL: 32

CAD FILE: 12089–G04–PLAN

DRAWING FILE NO. 4–139–62

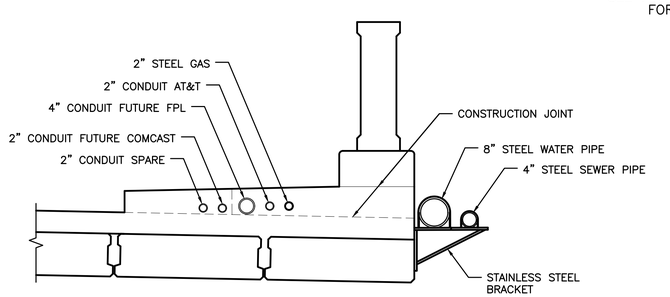


SECTION A-A



SECTION B-B

SEE FDOT STANDARD INDEX 20900
FOR ADDITIONAL DETAIL



DETAIL A

NOTES:

1. THE CONTRACTOR SHALL SUBMIT SIGNED AND SEALED SHOP DRAWINGS FOR THE 8" AND 4" WATER AND SEWER PIPE SUPPORTS.

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FIELD BOOK:

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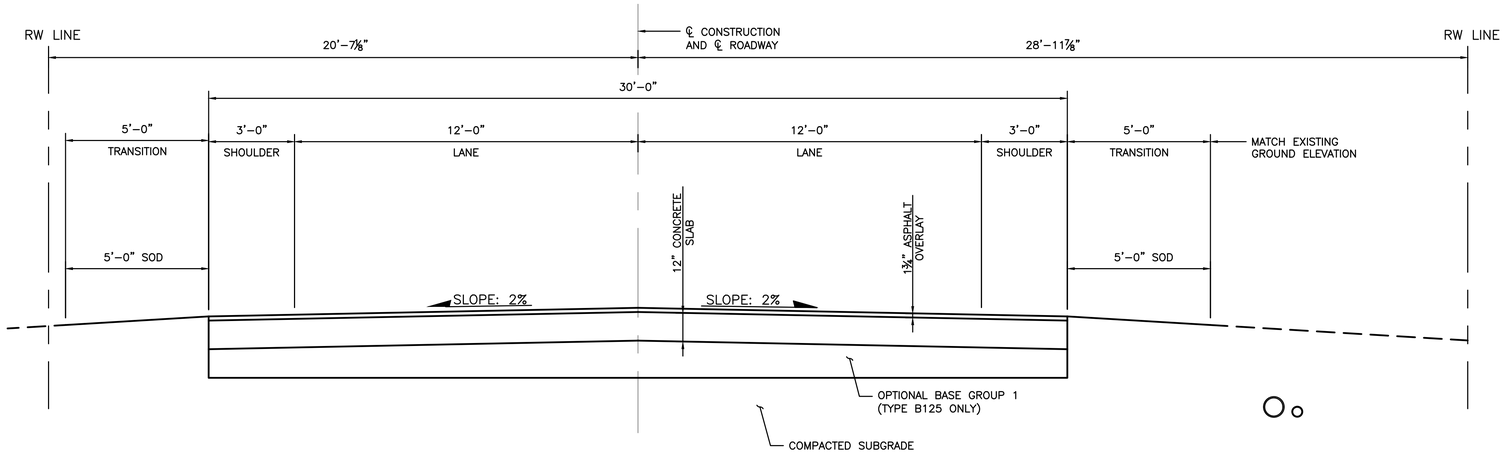
REVISIONS

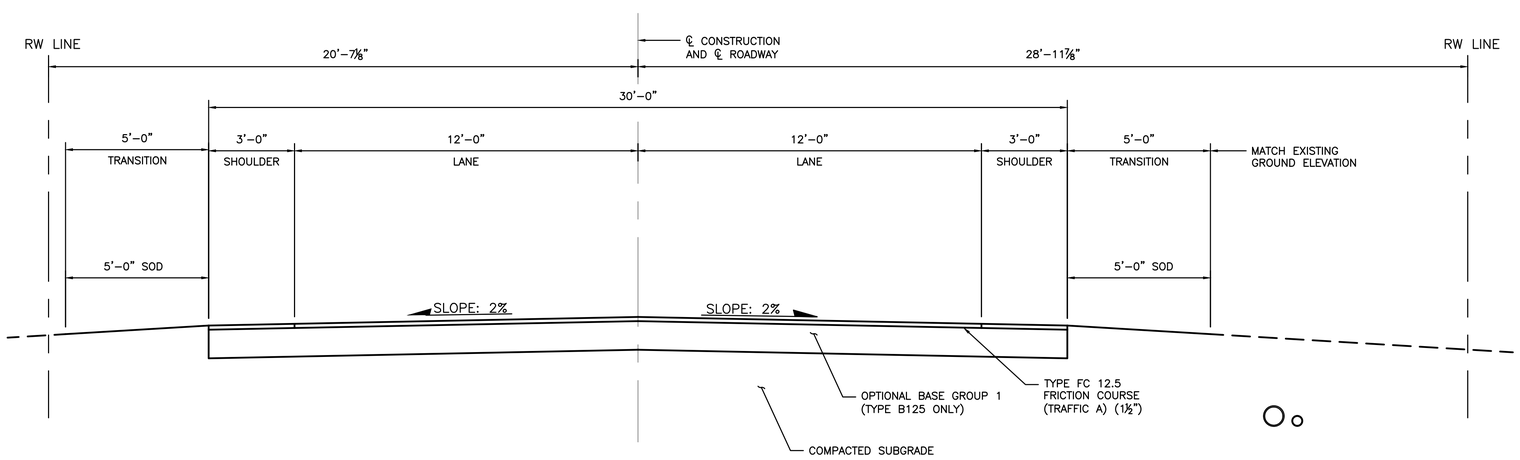
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TYPICAL SECTIONS (1 OF 2)
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. G05 OF 10
TOTAL: 32
CAD FILE: 12089-G05-SECT
DRAWING FILE NO. 4-139-62



SECTION C-C



SECTION D-D

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

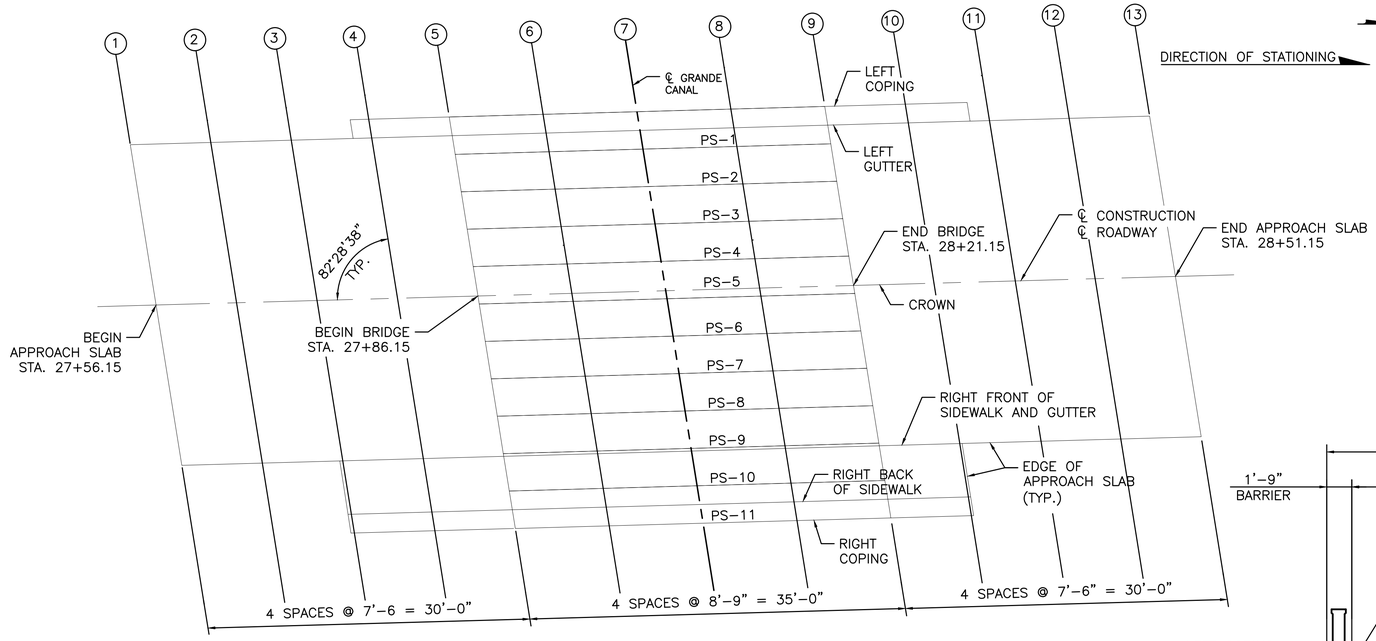
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TYPICAL SECTIONS (2 OF 2)
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
G06	10

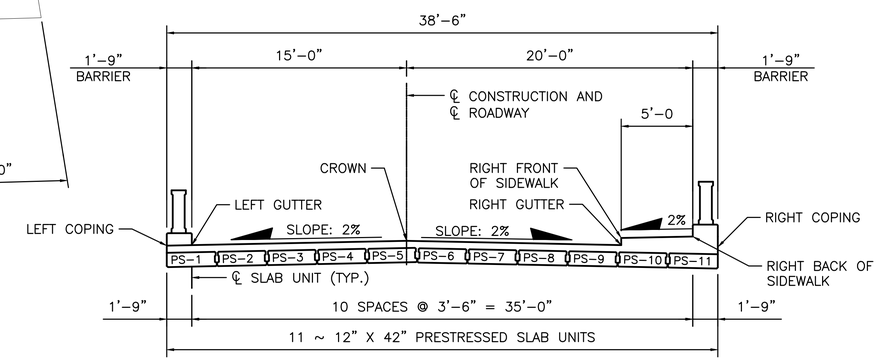
TOTAL: 32

CAD FILE: 12089-G06-SECT

DRAWING FILE NO. 4-139-62



SUPERSTRUCTURE PLAN



TYPICAL SECTION

FINISH GRADE ELEVATIONS

LOCATION	1	2	3	4	5	6	7	8	9	10	11	12	13
LEFT COPING	–	–	4.183	4.643	5.071	5.363	5.570	5.562	5.383	5.085	4.691	–	–
LEFT GUTTER	3.312	3.771	4.231	4.691	5.117	5.409	5.607	5.595	5.411	5.109	4.714	4.327	3.960
℄ BEAM 1	–	–	–	–	5.117	5.409	5.607	5.595	5.411	–	–	–	–
℄ BEAM 2	–	–	–	–	5.208	5.501	5.680	5.659	5.466	–	–	–	–
℄ BEAM 3	–	–	–	–	5.300	5.592	5.754	5.723	5.522	–	–	–	–
℄ BEAM 4	–	–	–	–	5.390	5.682	5.826	5.787	5.576	–	–	–	–
℄ BEAM 5	–	–	–	–	5.480	5.773	5.898	5.850	5.631	–	–	–	–
CROWN	3.729	4.189	4.649	5.109	5.506	5.798	5.919	5.868	5.646	5.310	4.913	4.531	4.169
℄ BEAM 6	–	–	–	–	5.470	5.762	5.870	5.813	5.584	–	–	–	–
℄ BEAM 7	–	–	–	–	5.419	5.711	5.801	5.735	5.498	–	–	–	–
℄ BEAM 8	–	–	–	–	5.368	5.660	5.732	5.657	5.410	–	–	–	–
℄ BEAM 9	–	–	–	–	5.316	5.609	5.663	5.578	5.323	–	–	–	–
RIGHT GUTTER	3.547	4.007	4.467	4.923	5.287	5.579	5.623	5.533	5.273	4.908	4.513	4.136	3.779
RIGHT FRONT OF SIDEWALK	4.047	4.507	4.967	5.423	5.787	6.079	6.123	6.033	5.773	5.408	5.013	4.636	4.279
℄ BEAM 10	–	–	–	–	5.764	6.056	6.092	5.999	5.735	–	–	–	–
℄ BEAM 11	–	–	–	–	5.711	6.004	6.022	5.920	5.646	–	–	–	–
RIGHT BACK OF SIDEWALK	3.987	4.446	4.906	5.359	5.711	6.004	6.022	5.920	5.646	5.274	4.880	4.505	4.150
RIGHT COPING	–	–	4.385	4.837	5.185	5.477	5.486	5.380	5.102	4.727	4.334	–	–

NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO TOP OF DECK.

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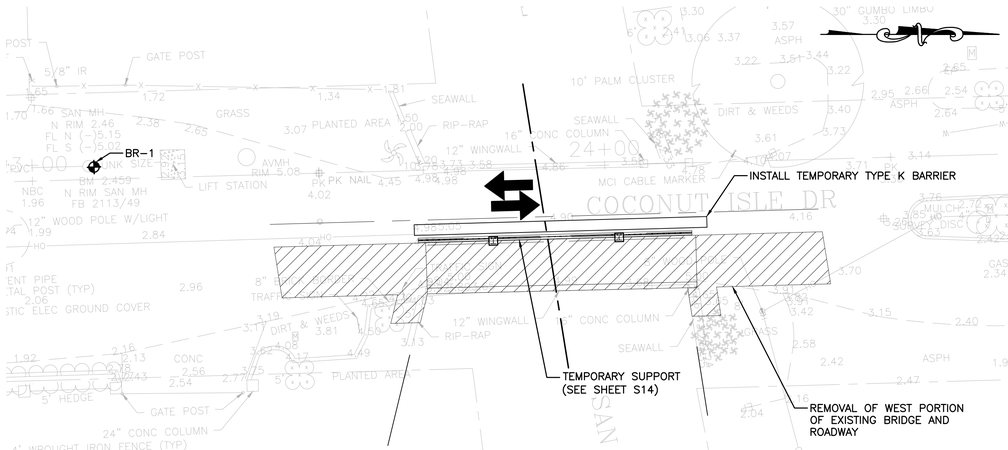
REVISIONS

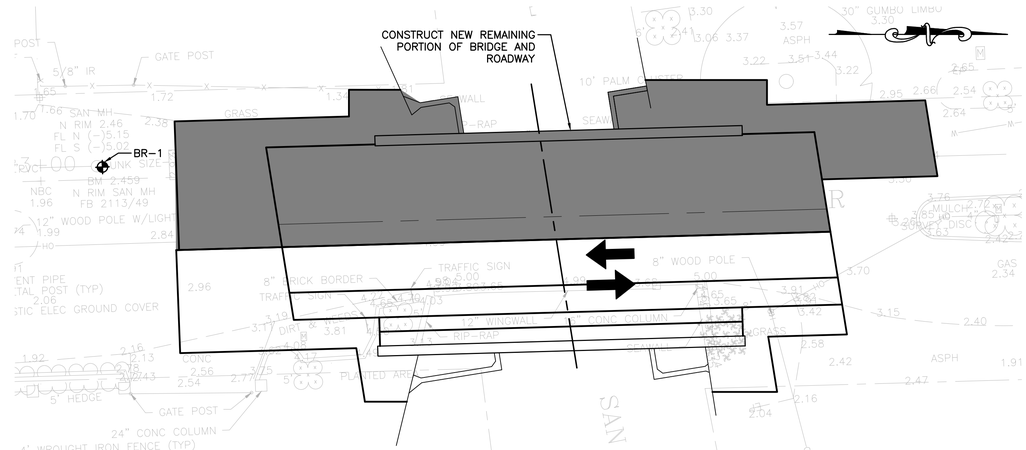
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FINISH GRADE ELEVATIONS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. G07 OF 10
TOTAL: 32
CAD FILE: 12089-G07-PLAN
DRAWING FILE NO. 4-139-62



PHASE 1



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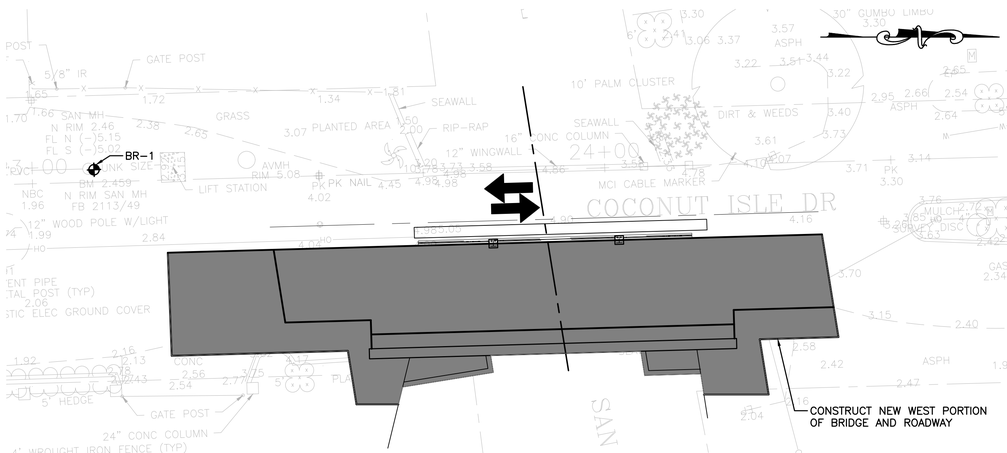

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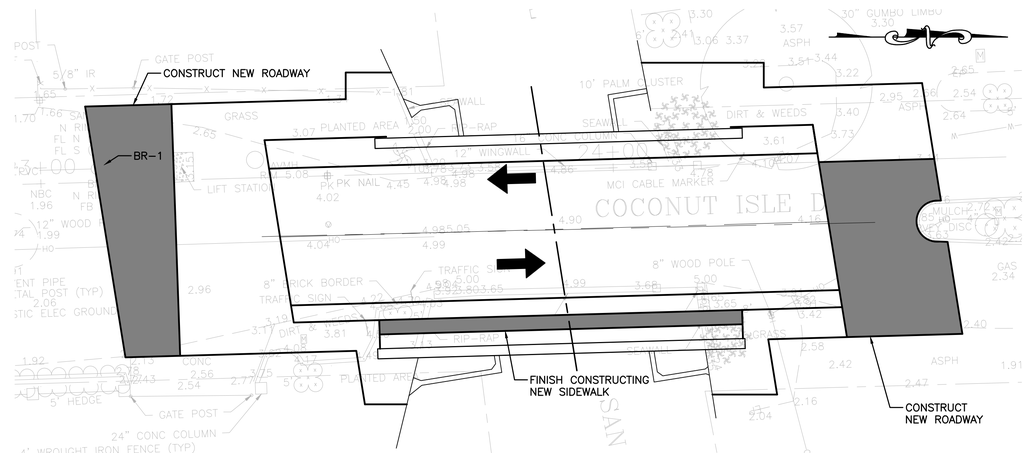

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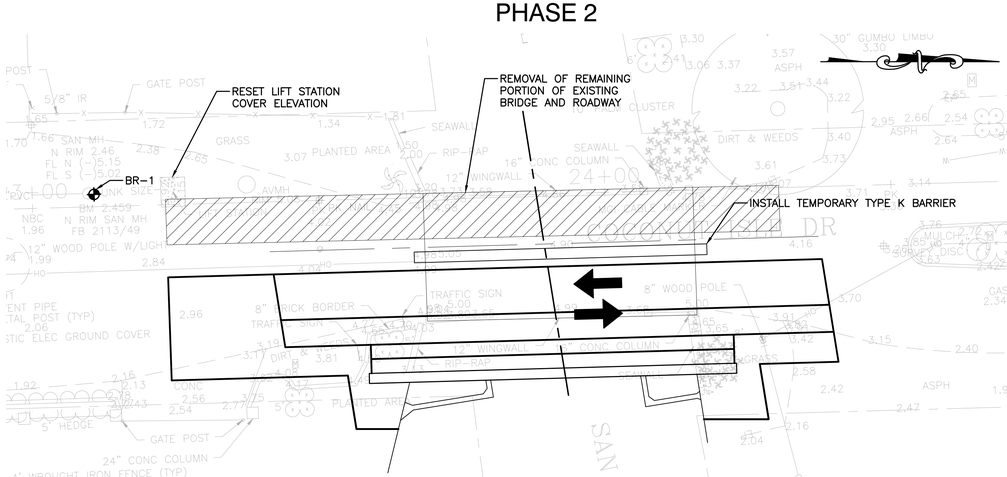

PHASE 3

LEGEND:

– REMOVAL LIMITS

– CONSTRUCTION LIMITS

NOTES:

1. FOR PHASING DESCRIPTION, SEE SHEET NO. G09.

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REVISIONS

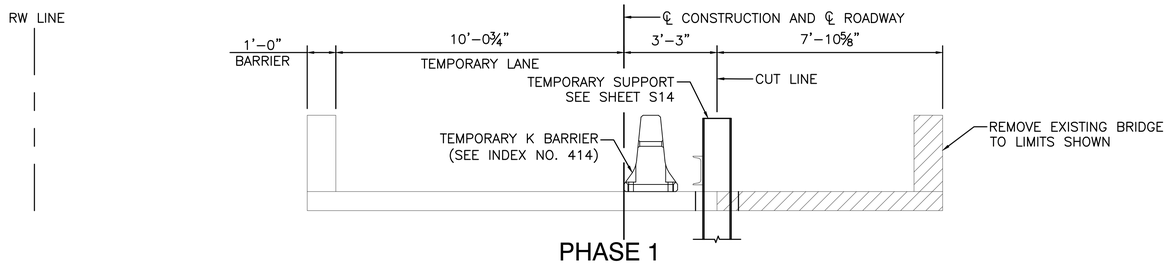
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
CONSTRUCTION PHASING PLAN
COCONUT ISLE DRIVE OVER GRANDE CANAL

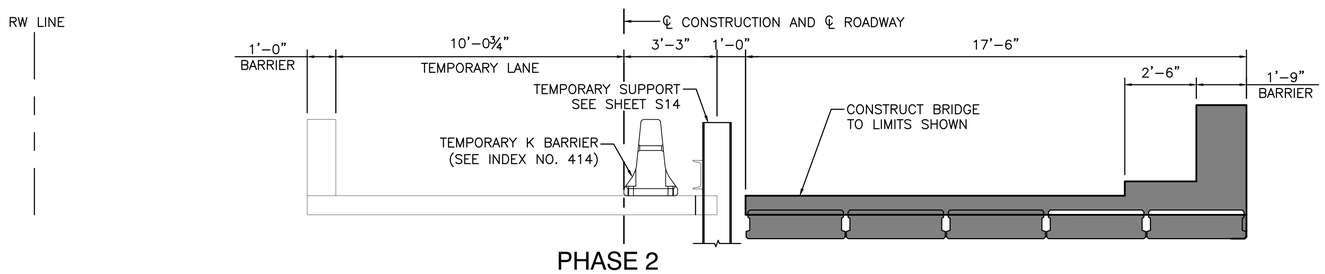
SHEET NO.	OF
G08	10
TOTAL:	32

CAD FILE: 12089–G08–PLAN

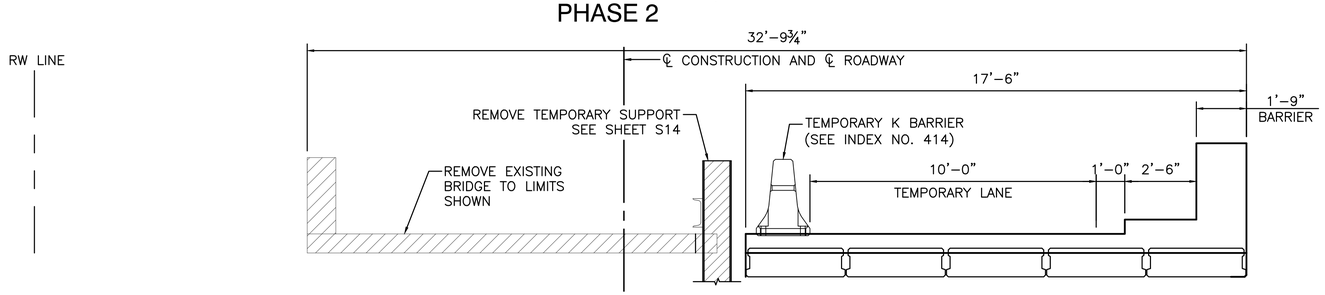
DRAWING FILE NO. 4–139–62



PHASE 1



PHASE 2



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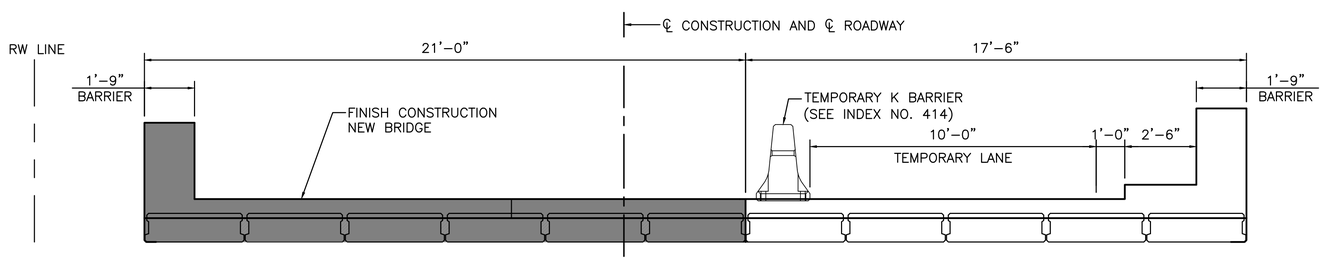

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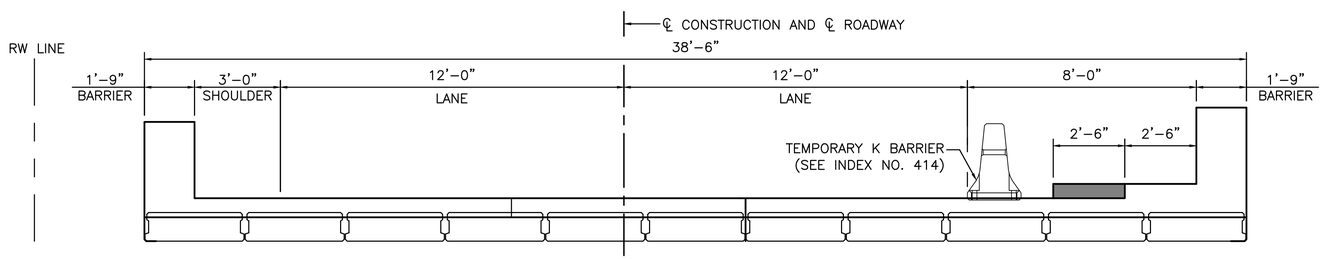

PHASE 5

RW LINE

PHASE 1

- PLACE TEMPORARY BARRIER PROVIDING BIDIRECTIONAL 10'–0" LANE
- CUT HOLES FOR TEMPORARY PILE INSTALLATION
- DRIVE TEMPORARY PILES (2 LOCATIONS)
- INSTALL TEMPORARY SUPPORT BEAM AND ANCHORS
- PARTIALLY REMOVE EXISTING BRIDGE AND EXISTING SEAWALL IN CONFLICT WITH NEW CONSTRUCTION

RW LINE

PHASE 2

- INSTALL PARTIAL SEAWALL
- PARTIALLY CONSTRUCT NEW BRIDGE TO THE LIMITS SHOWN

RW LINE

PHASE 3

- RELOCATE TEMPORARY BARRIER PROVIDING BIDIRECTIONAL 10'–0" LANE
- REMOVE REMAINDER OF EXISTING BRIDGE AND TEMPORARY SUPPORT AND EXISTING SEAWALL IN CONFLICT WITH NEW CONSTRUCTION

RW LINE

PHASE 4

- INSTALL PARTIAL SEAWALL
- FINISH CONSTRUCTION OF NEW BRIDGE TO THE LIMITS SHOWN

RW LINE

PHASE 5

- COMPLETE SIDEWALK
- COMPLETE APPROACH ROADWAY CONSTRUCTION

LEGEND:

– REMOVAL LIMITS

– CONSTRUCTION LIMITS

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

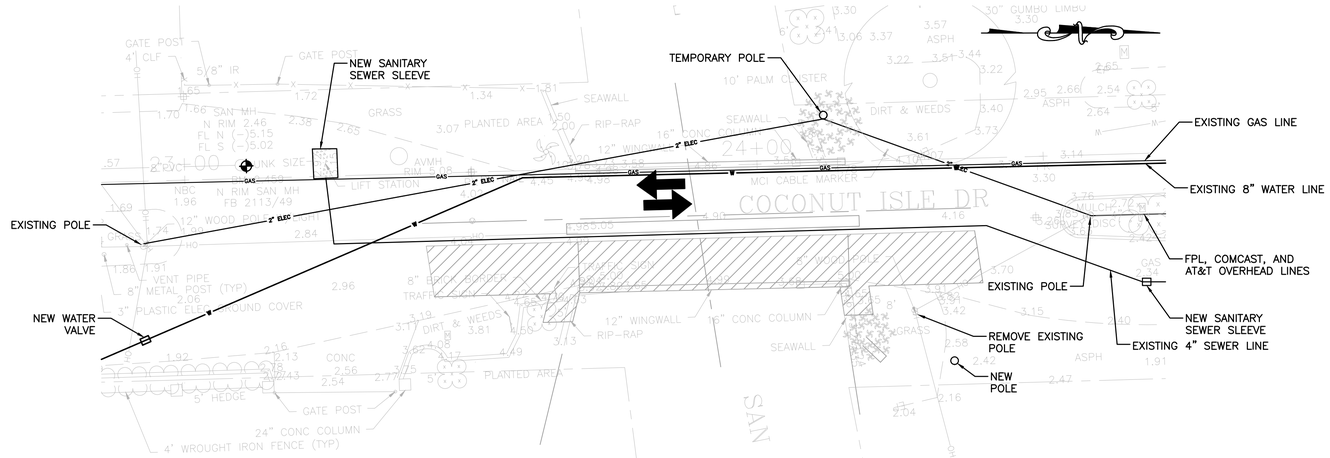
PROJECT # 12089
TWO COCONUT ISLE
BRIDGE REPLACEMENT
CONSTRUCTION PHASING SECTION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
G09	10

TOTAL: 32

CAD FILE: 12089–G09–SECT

DRAWING FILE NO. 4–139–62



PHASE 1

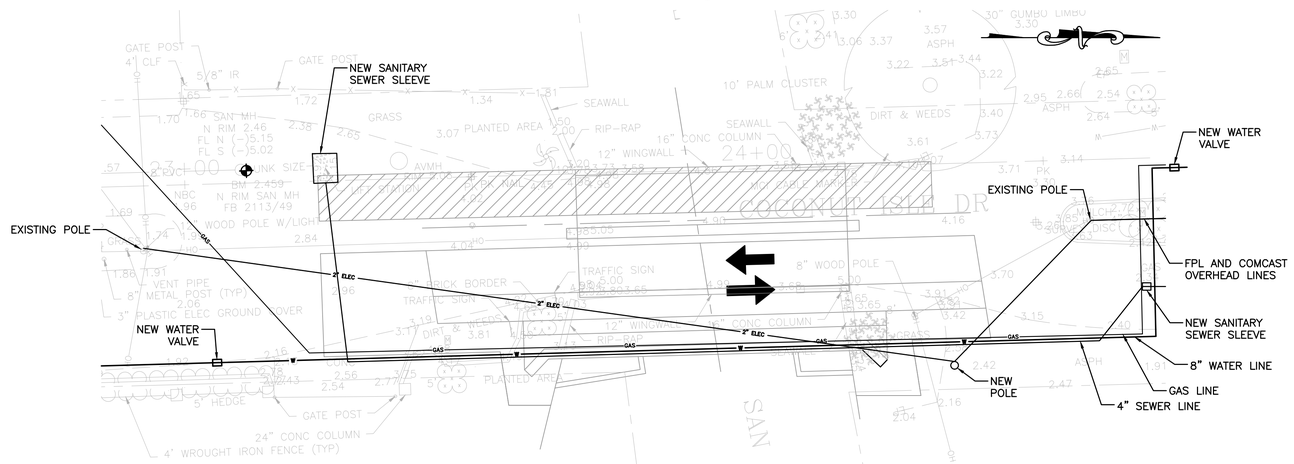
UTILITY PHASE 1

OH LINES: RELOCATE (FPL, COMCAST, AT&T) TO WEST USING TEMPORARY POLE BY FPL.

SEWER: RELOCATE 4" SEWER TO SPACE ON BRIDGE BETWEEN TEMPORARY SUPPORT AND BARRIERS.

UTILITY NOTE:

RELOCATE THE EXISTING 4" SEWER AND 8" WATER-MAIN AS NECESSARY TO PERFORM THE WORK. INSTALL THE NEW 4" SEWER AND 8" WATERMAIN AS SHOWN IN THE PLANS. COORDINATE WITH FPL, COMCAST, AT&T, AND TECO PEOPLE'S GAS TO PLAN AND FACILITATE THE RELOCATION OF THEIR UTILITIES.



PHASE 3

UTILITY PHASE 2 OR 3

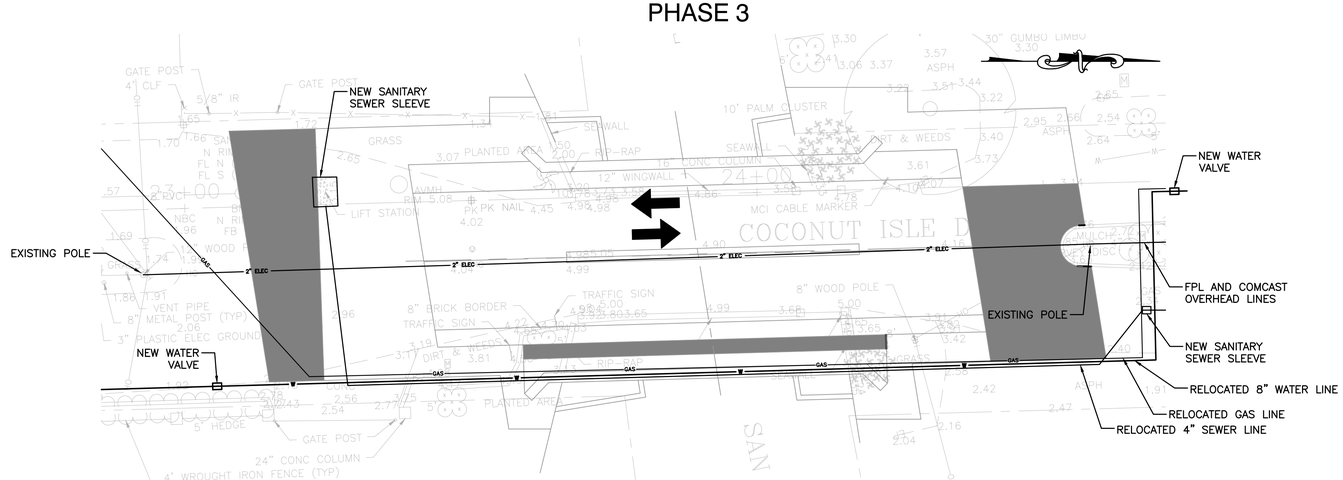
OH LINES: RELOCATE (FPL, COMCAST) TO EAST USING NEW FPL POLE.

AT&T: RELOCATE UNDERGROUND USING CONDUITS IN BRIDGE. REMOVE OH LINES.

SEWER: RELOCATE TO EAST SIDE. ATTACH ON UNDERSIDE OF BRIDGE. REMOVE TEMPORARY PIPE FROM SPACE BETWEEN TEMPORARY SUPPORTS AND BARRIERS.

GAS: RELOCATE USING CONDUITS IN BRIDGE. REMOVE LINE FROM WEST SIDE.

WATER: RELOCATE FROM WEST SIDE TO EAST SIDE OF BRIDGE. ATTACH TO THE SIDE OF BRIDGE.



PHASE 5

UTILITY PHASE 5

OH LINES: RELOCATE (FPL, COMCAST) TO ORIGINAL LOCATION OVER BRIDGE. REMOVE OH LINES (FPL, COMCAST) FROM EAST SIDE.

LEGEND:

– REMOVAL LIMITS

– CONSTRUCTION LIMITS

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NO.	DATE	BY	CHK'D	DESCRIPTION

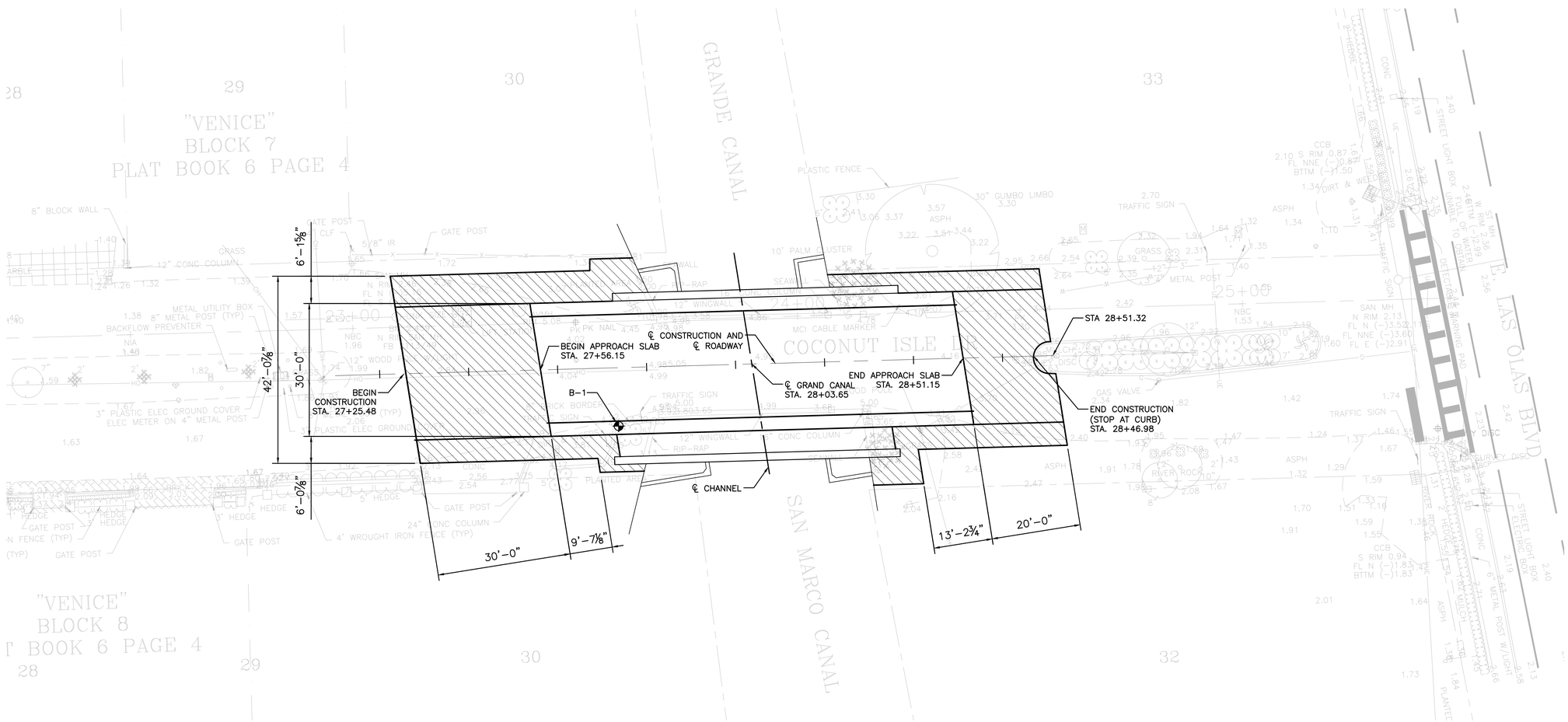
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
UTILITY PHASING PLAN
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
G10	10

TOTAL: 32

CAD FILE: 12089-G10-PLAN

DRAWING FILE NO. 4-139-62



ROADWAY PLAN

LEGEND:

PAVEMENT RECONSTRUCTION & HARMONIZATION

NOTES

1. COMPACT THE SUBGRADE IN ACCORDANCE WITH FDOT STANDARD SPECIFICATIONS 120-9.
2. PREPARE A FINISH SOIL LAYER IN ACCORDANCE WITH SECTION 162 OF THE FDOT STANDARD SPECIFICATION AND PLACE PERFORMANCE TURF IN ACCORDANCE WITH SECTION 570 OF THE FDOT STANDARD SPECIFICATION IN ALL WORK AREAS WITH EXCEPTION OF THE AREAS DEFINED AS SUBGRADE.

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

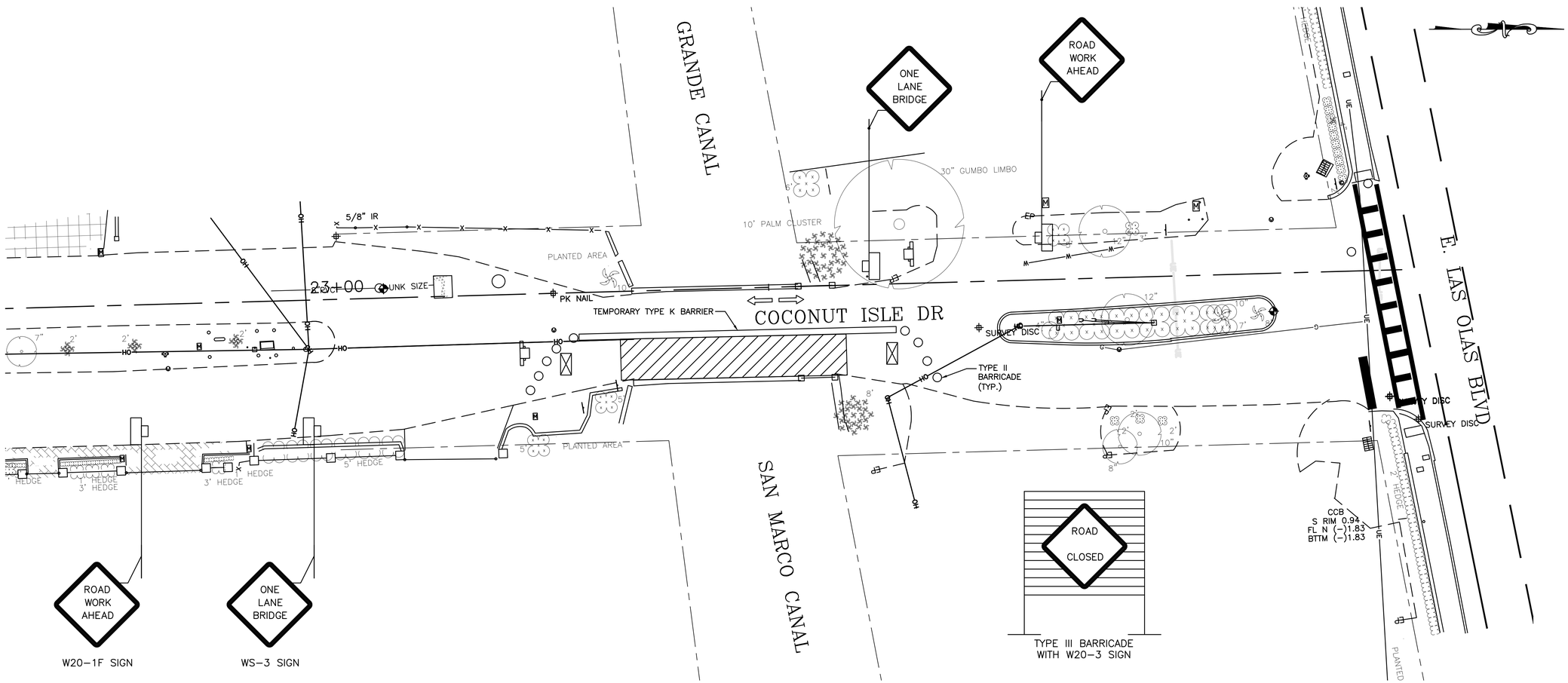
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
ROADWAY PLAN SHEET
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
001	2

TOTAL: 32

CAD FILE: 12089-001-PLAN

DRAWING FILE NO. 4-139-62



ROAD WORK AHEAD

W20-1F SIGN

ONE LANE BRIDGE

WS-3 SIGN

TYPE III BARRICADE WITH W20-3 SIGN

WORK AREA

WORK ZONE SIGN

CHANNELIZING DEVICE (SEE INDEX NO. 600)

TRAFFIC SIGNAL

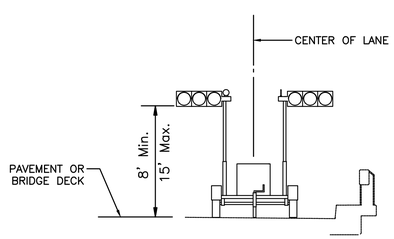
TYPE III BARRICADE

STOP BAR

FLAGGER

PORTABLE SIGNAL

LANE IDENTIFICATION + DIRECTION OF TRAFFIC



PORTABLE SIGNALS

SIGNAL MOUNT DETAILS

GENERAL NOTES:

1. WORK OPERATIONS SHALL BE CONFINED TO ONE TRAVEL LANE, LEAVING THE OPPOSING TRAVEL LANE OPEN TO TRAFFIC.
2. WHEN VEHICLES IN A PARKING ZONE BLOCK THE LINE OF SIGHT TO TCZ SIGNS OR WHEN TCZ SIGNS ENCROACH ON A NORMAL PEDESTRIAN WALKWAY, THE SIGNS SHALL BE POST MOUNTED AND LOCATED IN ACCORDANCE WITH INDEX NO. 17302.
3. THE INSTALLATION AND TIMING OF SIGNALS SHALL BE APPROVED BY THE DISTRICT TRAFFIC OPERATIONS ENGINEER PRIOR TO SIGNALS BEING PLACED IN OPERATION. WHERE SIGHT DISTANCE TO THE SIGNAL IS LIMITED, THE SIGNALS MAY BE MOUNTED ON SPAN WIRE OR RELOCATED AT THE DISCRETION OF THE ENGINEER. WHETHER THE SIGNALS ARE IN AUTOMATIC MODE OR BEING CONTROLLED MANUALLY, IN NO CASE WILL THE DISTANCE BETWEEN THE PORTABLE SIGNALS (RECEIVER/CONTROLLERS) EXCEED THE MAXIMUM DISTANCE AT WHICH BOTH OF THE PORTABLE SIGNALS CAN BE POSITIVELY AND SAFELY OPERATED.
4. SPAN WIRE SIGNALS ARE TO BE USED ONLY IN WORK ZONES WITH WORKERS PRESENT, WHERE THE CONTRACTOR CAN MONITOR SIGNAL OPERATION AND MAINTAIN TRAFFIC WITH FLAGGERS IN THE EVENT OF A POWER FAILURE.
5. SIGNAL AHEAD AND EQULPMENT CROSSING AHEAD SIGNS ARE TO BE REMOVED OR FULLY COVERED WHEN NO WORK IS BEING PERFORMED AND THE HIGHWAY IS OPEN TO TWO-WAY TRAFFIC. TYPE ILL BARRICADES SHALL BE IN PLACE TO BLOCK HAUL ROAD ACCESS WHEN THE HAUL ROAD IS NOT IN OPERATION AND A FLAGGER/SIGNAL OPERATOR IS NOT ON DUTY, EXCEPT WHEN THE HAUL ROAD IS AN EXISTING PROPERLY MARKED ROAD.
6. THE MAXIMUM SPACING BETWEEN DEVICES SHALL BE NO GREATER THAN 25.'
7. FOR GENERAL TCZ REQUIREMENTS AND ADDITIONAL INFORMATION, REFER TO INDEX NO. 600.
8. THE TWO CHANNELIZING DEVICES DIRECTLY IN FRONT AND DIRECTLY AT THE END OF THE WORK AREA MAY BE OMITTED PROVIDED VEHICLES IN THE WORK AREA HAVE HIGH-INTENSITY ROTATING, FLASHING, OSCILLATING, OR STROBE LIGHTS OPERATING.

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RS	
CHECKED BY:	
CG	
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PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

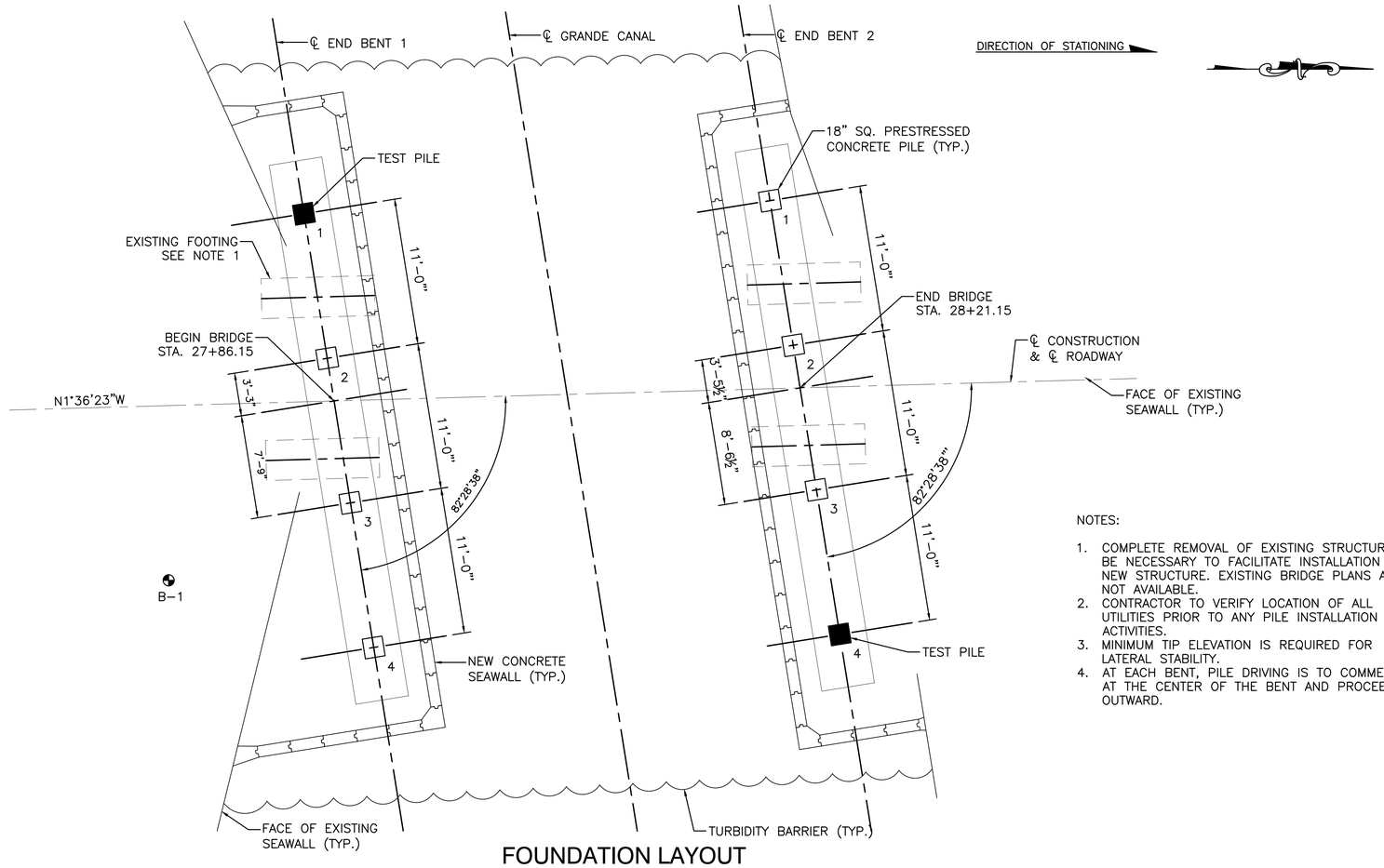
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TEMPORARY TRAFFIC CONTROL
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
002	2

TOTAL: 32

CAD FILE: 12089-002-PLAN

DRAWING FILE NO. 4-139-62



FOUNDATION LAYOUT

NOTES:

1. COMPLETE REMOVAL OF EXISTING STRUCTURE MAY BE NECESSARY TO FACILITATE INSTALLATION OF NEW STRUCTURE. EXISTING BRIDGE PLANS ARE NOT AVAILABLE.
2. CONTRACTOR TO VERIFY LOCATION OF ALL UTILITIES PRIOR TO ANY PILE INSTALLATION ACTIVITIES.
3. MINIMUM TIP ELEVATION IS REQUIRED FOR LATERAL STABILITY.
4. AT EACH BENT, PILE DRIVING IS TO COMMENCE AT THE CENTER OF THE BENT AND PROCEED OUTWARD.

PILE CUT-OFF ELEVATIONS

PILE NO.	1	2	3	4
END BENT 1	1.747	1.967	1.877	1.657
END BENT 2	1.747	1.967	1.877	1.657

PILE DATA TABLE

INSTALLATION CRITERIA								DESIGN CRITERIA						
BENT NUMBER	PILE SIZE (IN)	NOMINAL BEARING CAPACITY (TONS)	TENSION CAPACITY (TONS)	MINIMUM TIP ELEVATION (FT)	TEST PILE LENGTH (FT)	REQ'D JET ELEVATION (FT)	REQ'D PREFORM ELEV. (FT)	FACTORED DESIGN LOAD (TONS)	DOWN DRAG (TONS)	TOTAL SCOUR RESISTANCE (TONS)	NET SCOUR RESISTANCE (TONS)	100 YEAR SCOUR ELEVATION (FT)	LONG TERM SCOUR ELEVATION (FT)	RESISTANCE FACTOR
END BENT 1	18	282	N/A	−30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65
END BENT 2	18	282	N/A	−30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65

FACTORED DESIGN LOAD/ϕ $\leq$ NOMINAL BEARING CAPACITY

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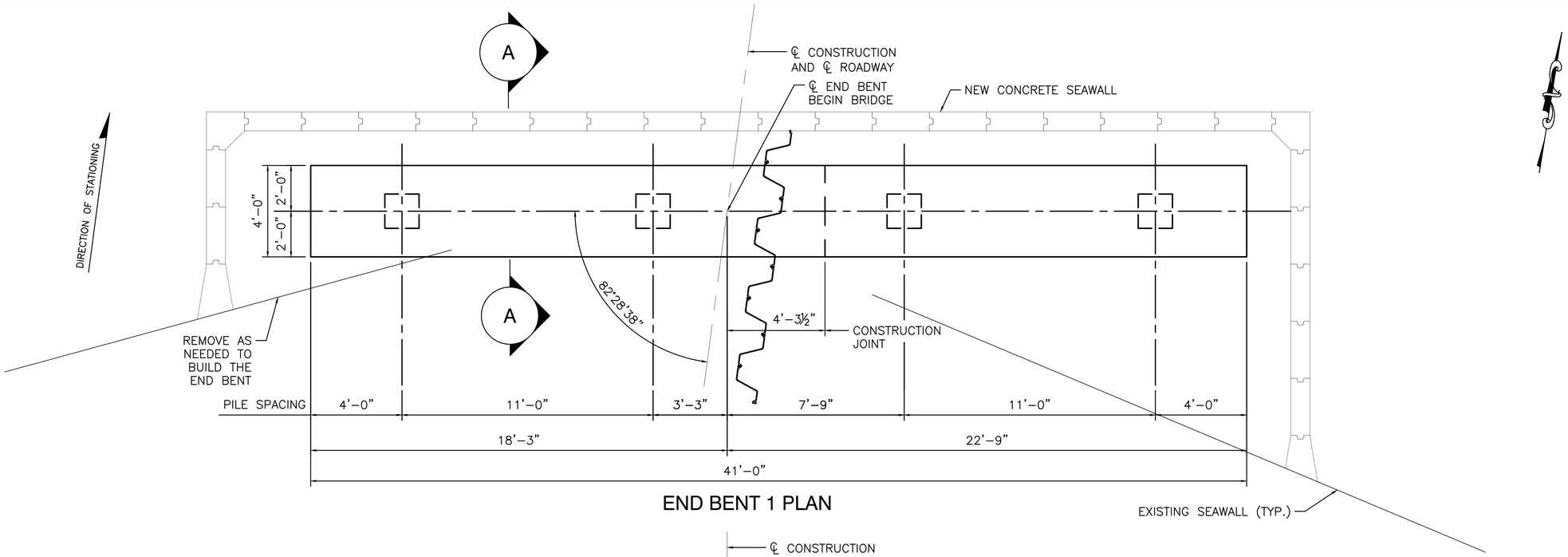
REVISIONS

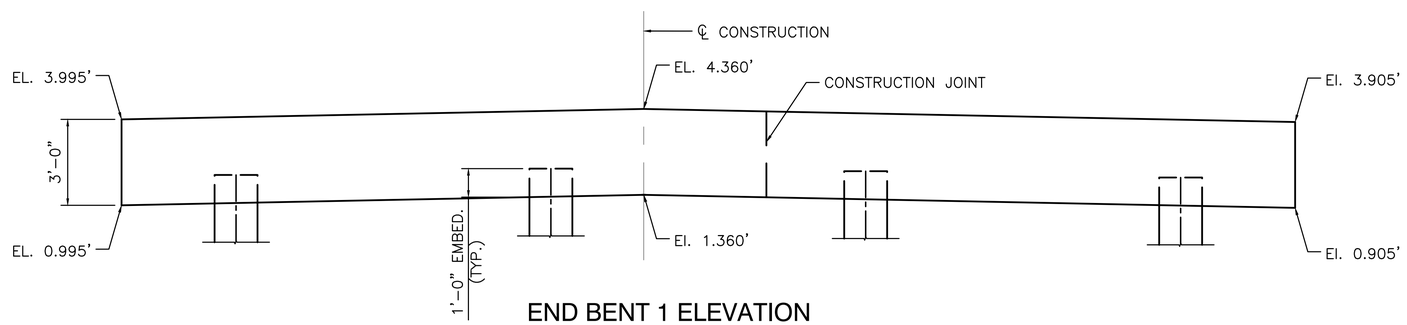
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FOUNDATION LAYOUT
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S02 OF 19
TOTAL: 32
CAD FILE: 12089-S02-FOUN
DRAWING FILE NO. 4-139-62

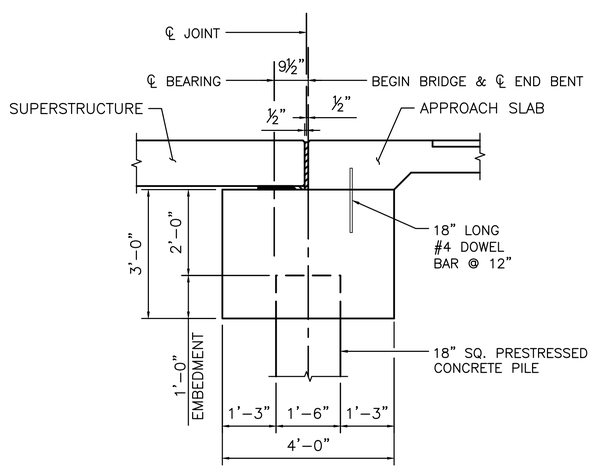


END BENT 1 PLAN



END BENT 1 ELEVATION

LOOKING UPSTATION



SECTION A-A

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

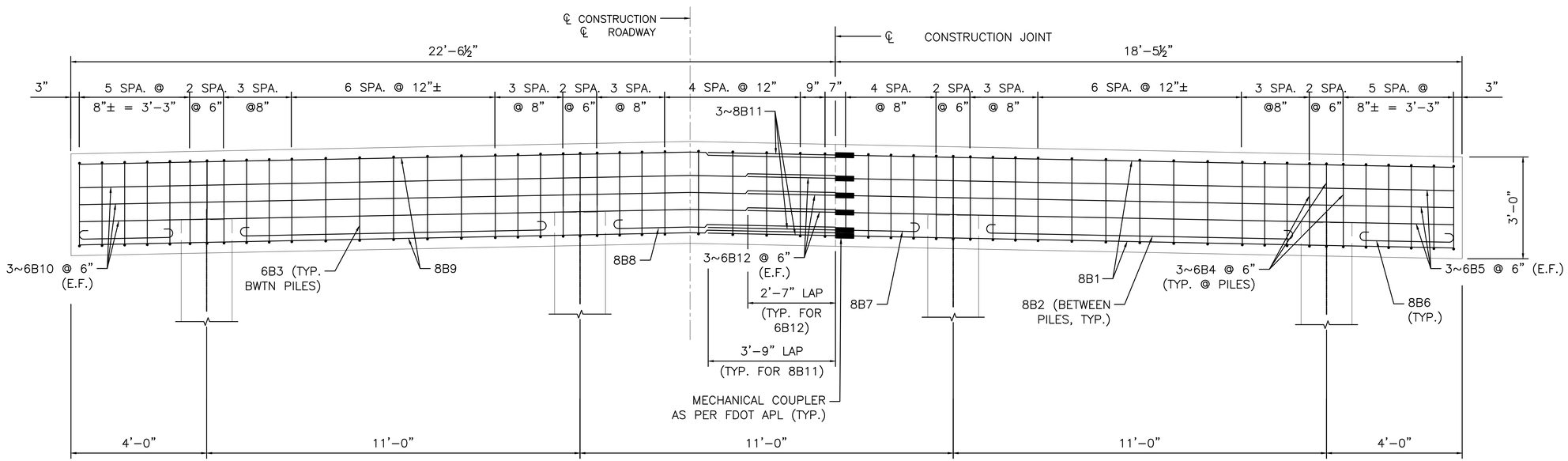
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 1 PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S03	19

TOTAL: 32

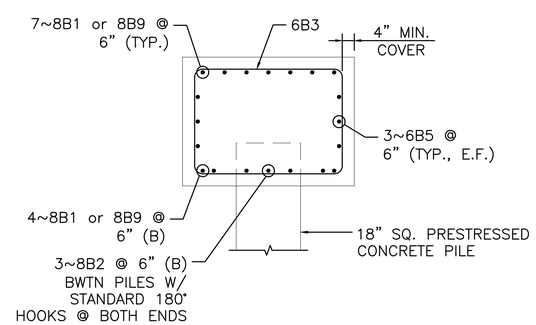
CAD FILE: 12089-S03-PLAN

DRAWING FILE NO. 4-139-62

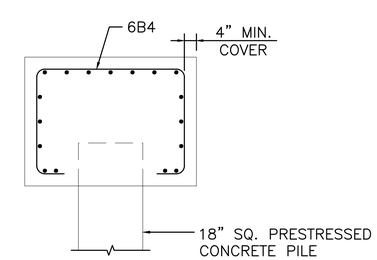


ELEVATION

LOOKING UPSTATION



SECTION BETWEEN PILES



SECTION AT PILES

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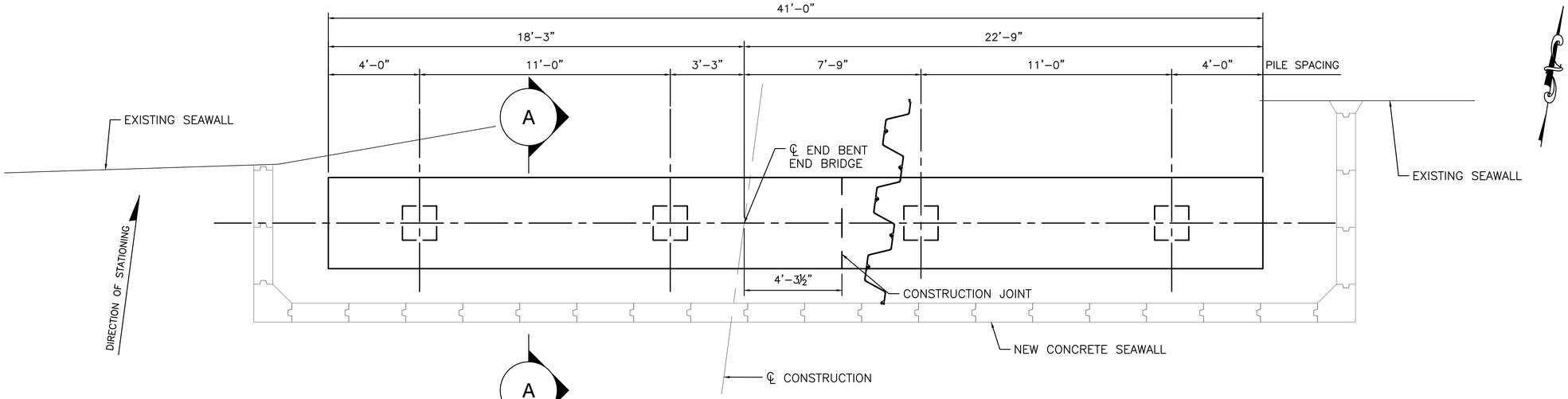
REVISIONS

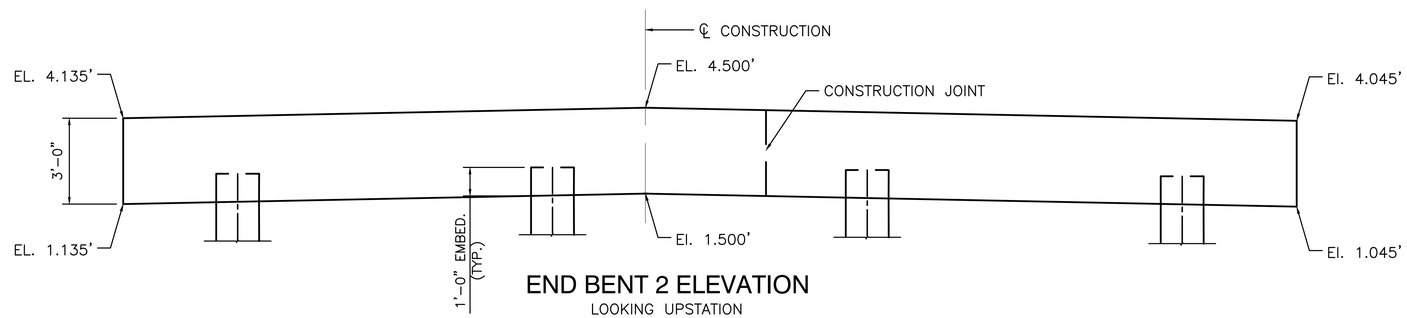
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 1 DETAILS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S04 OF 19
TOTAL: 32
CAD FILE: 12089-S04-DETAILS
DRAWING FILE NO. 4-139-62

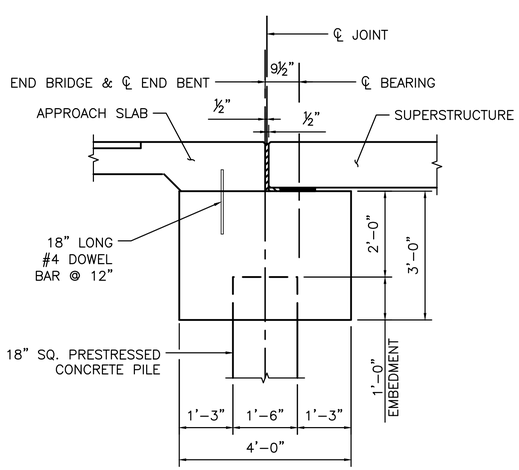


END BENT 2 PLAN



END BENT 2 ELEVATION

LOOKING UPSTATION



SECTION A-A

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ENGINEERING & ARCHITECTURE
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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

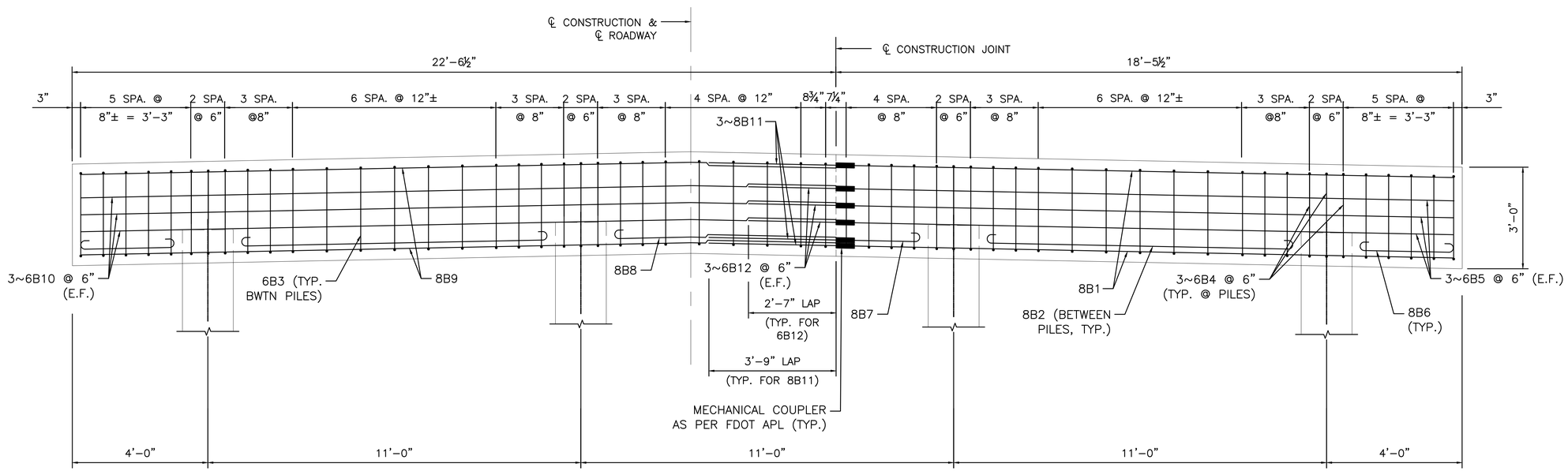
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 2 PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S05	19

TOTAL: 32

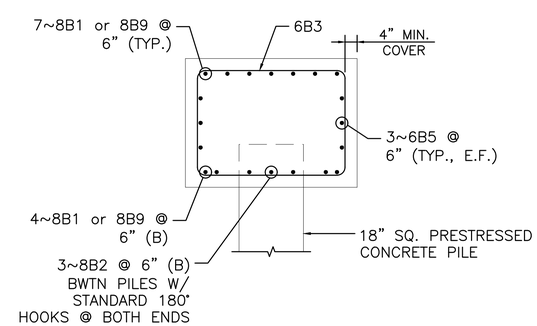
CAD FILE: 12089-S05-PLAN

DRAWING FILE NO. 4-139-62



ELEVATION

LOOKING UPSTATION



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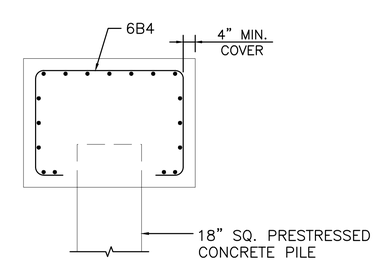

SECTION AT PILES

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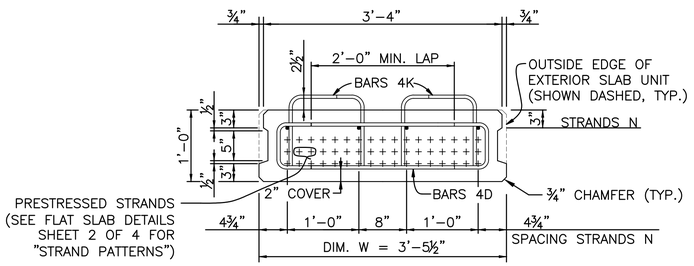
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 2 DETAILS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S06 OF 19
TOTAL: 32
CAD FILE: 12089-S06-DETL
DRAWING FILE NO. 4-139-62



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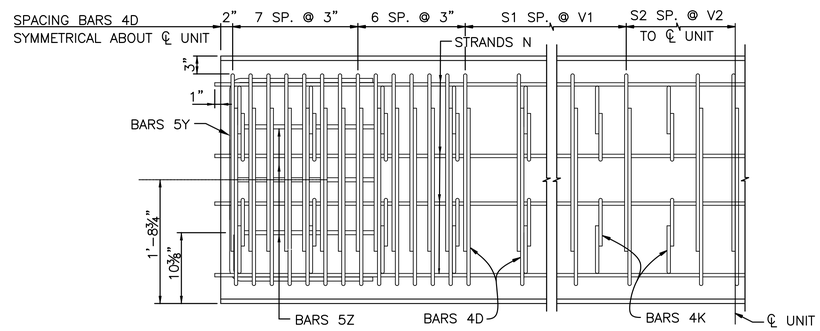
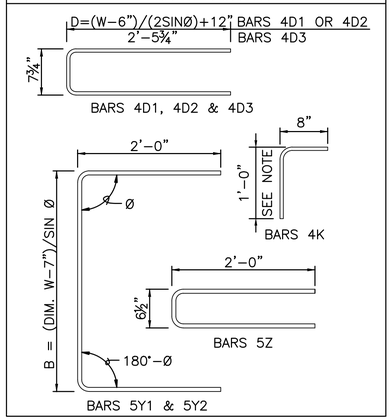
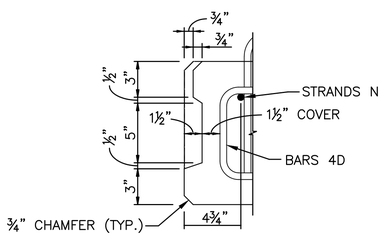


PARTIAL PLAN OF PRESTRESSED SLAB UNIT

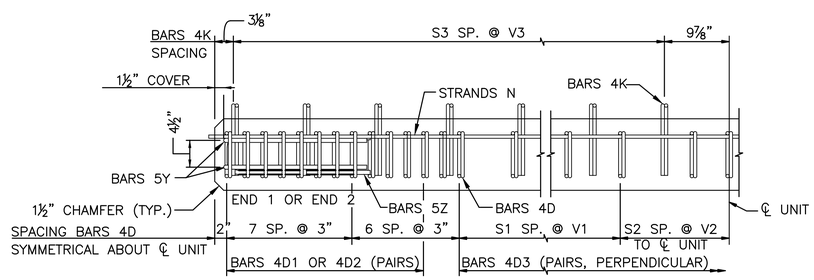
BILL OF REINFORCING STEEL FOR ONE UNIT ONLY				
MARK	SIZE	NOTE NUMBERS	NUMBER REQUIRED	LENGTH (NOTE 1)
D1	4	4, 5, 10	26 (END 1)	VARIES
D2	4	4, 5, 10	26 (END 2)	VARIES
D3	4	5	SEE TABLE	5'–7¼"
K	4	4, 5	SEE TABLE	1'–8"
N	⅜" Ø STRANDS	2, 9	4	DIM. L + 2"
Y1	5	4, 10	2 (END 1)	VARIES
Y2	5	4, 10	2 (END 2)	VARIES
Z	5	–	6	4'–7"

BENDING DIAGRAMS





KEYWAY DETAIL



PARTIAL ELEVATION OF PRESTRESSED SLAB UNIT

NOTES;

1. 4K BARS ARE EXTENDED AT OUTSIDE FACE OF EXTERIOR SLABS

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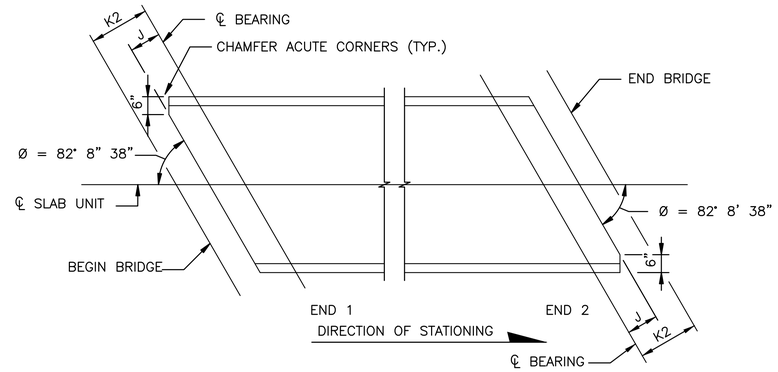
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

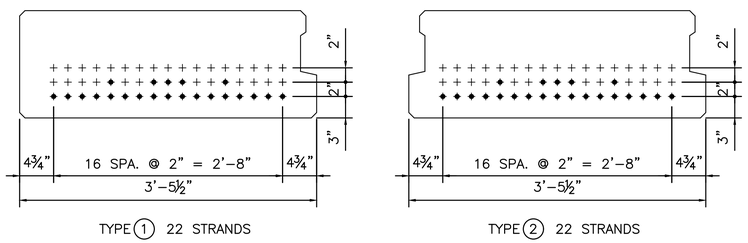
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FLAT SLAB DETAILS (1 OF 4)
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S07 OF 19
TOTAL: 32
CAD FILE: 12089–S07–DETL
DRAWING FILE NO. 4–139–62

TABLE OF VARIABLES – PRESTRESSED STANDARD SLAB UNITS																					
LOCATION		CONCRETE PROPERTIES			STND. PTRN. TYPE	END OF UNIT **			UNIT DIMENSIONS		REINFORCING STEEL								RAILING REINF. ***		
SPAN NO.	SLAB UNIT NO.(S) / TYPE	CLASS	STRENGTHS (PSI) 28 DAY	STRENGTHS (PSI) RELEASE		DIM J	DIM K1	DIM K2	DIM L	DIM R	4D3. NO.	4K NO.	NO. OF BAR SPACES S1	NO. OF BAR SPACES S2	NO. OF BAR SPACES S3	BAR SPACING * V1	BAR SPACING * V2	BAR SPACING * V3	INDEX NO.	CASE	DIM X.
1	PS–1 12"X42"	VI	8,500	6,000	1	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–2 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–3 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–4 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–5 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–6 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–7 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–8 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–9 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–10 12"X42"	VI	8500	6000	2	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			
1	PS–11 12"X42"	VI	8500	6000	1	4½"	9½"	9½"	34'–2"	⅛"	65	140	32	1	16	5"	4"	12"			



SCHEMATIC PLAN VIEW AT SLAB END



STRAND DESCRIPTION: USE ½" DIAMETER, GRADE 270, LOW RELAXATION STRANDS STRESSED AT 31 KIPS EACH. AREA PER STRAND EQUALS 0.153 SQ. IN.

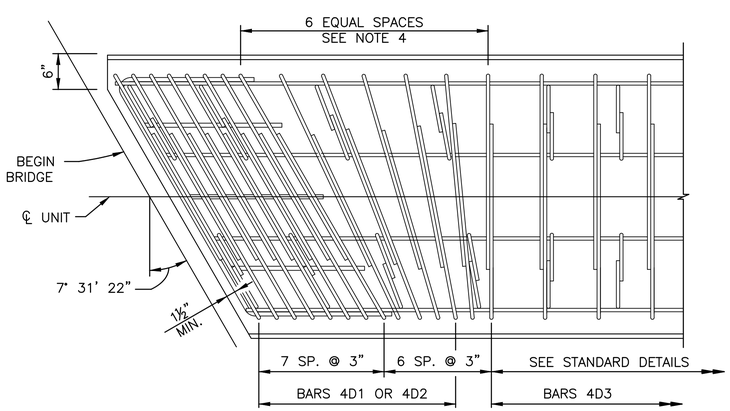
STRAND PATTERNS

STRAND DEBONDING LEGEND
- FULLY BONDED STRANDS.

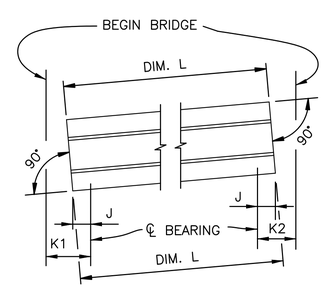
DIMENSION NOTES:
- * ALL LONGITUDINAL SLAB UNIT DIMENSIONS SHOWN ON THIS SHEET WITH A SINGLE ASTERISK (*) ARE MEASURED ALON THE TOP OF UNIT AT THE CENTERLINE OF SLAB UNIT. DIMENSION "R" IS CALCULATED AT MID–HEIGHT OF THE SLAB UNIT.
- ** END OF SLAB UNIT BEARING DIMENSIONS "J" AND "K" ARE MEASURED PERPENDICULAR TO ℄ BEARING ALONG THE BOTTOM OF THE SLAB.
- *** SEE SHEET S11 FOR MODIFICATIONS TO 4K BARS AT EXTERIOR SLAB.

PRESTRESSED SLAB UNIT (PSU) FABRICATION NOTES

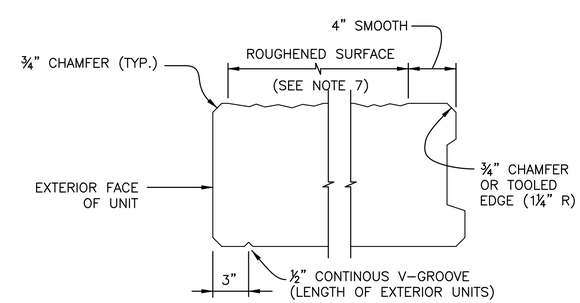
1. ALL BAR DIMENSIONS ARE OUT–TO–OUT.
2. STRANDS N SHALL BE ASTM A416, GRADE 250 OR 270, ⅜" Ø OR LARGER, STRESSED TO 10,000 LBS. EACH.
3. UNLESS OTHERWISE NOTED, THE MINIMUM CONCRETE COVER FOR REINFORCING STEEL SHALL BE 2".
4. FOR SLAB UNITS WITH SKEWED END CONDITIONS, THE END REINFORCEMENT, DEFINED AS BARS 4D1, 4D2, 4K AND Y WITHIN THE LIMITS OF THE FIRST 2'–0", SHALL BE PLACED PARALLEL TO THE SKEWED ENDS OF THE SLAB UNIT. THE NEXT SETS OF BARS 4D1 OR 4D2 & 4K SHALL BE FANNED TO PROVIDE EQUAL SPACING. SEE "SKEWED END TREATMENT DETAIL".
5. BARS 4D1, 4D2, 4D3 & 4K SHALL BE PLACED AND TIED TO STRANDS N AND A FULLY BONDED STRAND IN THE BOTTOM ROW. SEE "STRAND PATTERNS".
6. AT THE CONTRACTOR'S OPTION, DEFORMED WELDED WIRE REINFORCEMENT MAY BE USED IN LIEU OF BARS 4D AND 4K. SUBMIT DETAILS TO THE ENGINEER FOR APPROVAL.
7. TOP SURFACE OF THE SLAB UNITS SHALL BE RAKED TRANSVERSELY TO PROVIDE A ROUGHENED SURFACE WITH ¼" AMPLITUDE, EXCEPT THE TOP EDGE ADJACENT TO ALL KEYED JOINTS SHALL BE TROWELED SMOOTH FOR BONDING OF THE CRACK ARREST STRIPS. FOR PROPER BONDING OF THE DECK OVERLAY, CLEAN THE TOP SURFACE OF THE PRESTRESSED SLAB UNITS, APPLY CRACK ARREST STRIPS ABOVE GROUTED JOINTS, THOROUGHLY SOAK TOP SURFACE WITH POTABLE WATER FOR A MINIMUM OF 4 HRS. THEN REMOVE ALL EXCESS SURFACE WATER IMMEDIATELY PRIOR TO PLACEMENT OF THE OVERLAY.
8. CUT STRANDS 1" BEYOND THE FACE OF THE SLAB UNIT.
9. BARS 4D1 & 5Y1 CORRESPOND TO END 1, AND 4D2 & 5Y2 CORRESPOND TO END 2.



SKEWED END TREATMENT DETAIL



SCHEMATIC SIDE ELEVATION OF SLAB UNITS (POSITIVE GRADE SHOWN, NEGATIVE GRADE OR HORIZONTAL GRADE SIMILAR)



V-GROOVE & TOP SURFACE FINISH DETAILS (EXTERIOR UNIT SHOWN, FINISH SIMILAR FOR INTERIOR UNITS)

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CHECKED BY: CG | FIELD BOOK:

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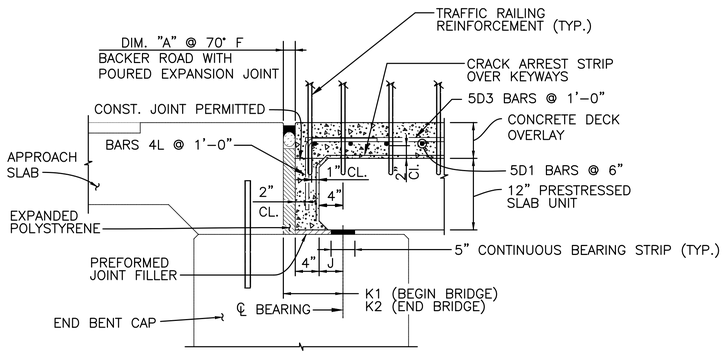
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FLAT SLAB DETAILS (2 OF 4)
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S08 OF 19
TOTAL: 32
CAD FILE: 12089–S08–DETL
DRAWING FILE NO. 4–139–62



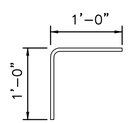
JOINT DETAIL AT BEGIN/END BRIDGE

NOTE:
DECK OVERLAY REINFORCING IS SHOWN AT NOMINAL SPACING. SEE DECK REINFORCING PLANS FOR ACTUAL SPACING AND ORIENTATION.

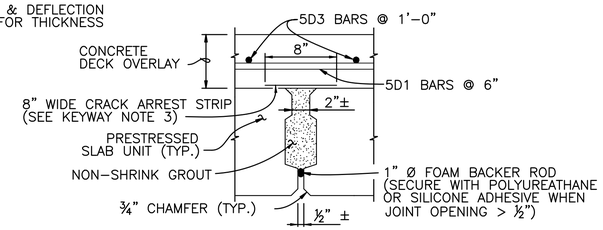
* SEE OVERLAY & DEFLECTION DATA TABLE FOR THICKNESS

POURED EXPANSION JOINT DATA TABLE INDEX NO. 21110			
LOCATION	DIM. "A" @ 70°F	TOTAL DESIGN MOVEMENT	DIM. "A" ADJUSTMENT PER 10°F
END BENT 1	1"	1/4"	1/16"
END BENT 2	1"	1/4"	1/16"

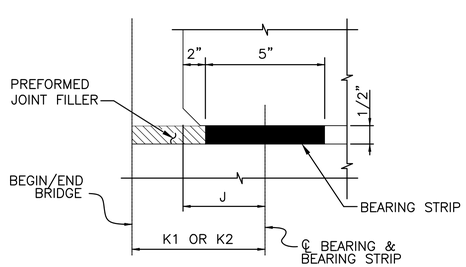
NOTE:
DIM. "A" ADJUSTMENT PER 10°F SHOWN IS MEASURED PERPENDICULAR TO ℄ EXPANSION JOINT. WORK THIS TABLE WITH DESIGN STANDARDS INDEX NO. 21110.



BARS 4L DETAIL



KEYWAY DETAIL



PARTIAL SIDE ELEVATION (ALONG ℄ BEARING)

KEYWAY NOTES:
1. AT EVERY KEYWAY TROWEL NON-SHRINK GROUT LEVEL WITH THE TOP SURFACE OF THE PRESTRESSED SLAB UNIT.
2. PLACE AN 8" WIDE CRACK ARREST STRIP OVER KEYWAY FOR THE LENGTH OF BRIDGE BETWEEN EXPANSION JOINTS.
3. CRACK ARREST STRIP SHALL BE A MAXIMUM OF 6" THICK AND MEET ONE OF THE FOLLOWING:
   A.) PRECURED SILICONE SEALANT MEETING SECTION 932 AND ON THE APL;
   B.) MASTIC, RUBBER OR BUTYL SEALING BANDS MEETING REQUIREMENTS OF ASTM C877;
   C.) OTHER EQUIVALENT MATERIAL APPROVED BY THE ENGINEER.
4. APPLY CRACK ARREST STRIP IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

BEARING STRIP NOTES:
1. BEARING STRIPS SHALL HAVE A SHEAR MODULUS (G) OF 110 PSI.
2. PROVIDE BEARING STRIPS IN ACCORDANCE WITH SPECIFICATION 932 (PLAIN ELASTOMERIC BEARING PADS).
3. BEARING STRIPS SHALL BE CONTINUOUS ACROSS MINIMUM OF 4 PRESTRESSED SLAB UNITS.

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FLAT SLAB DETAILS (3 OF 4)
COCONUT ISLE DRIVE OVER GRANDE CANAL

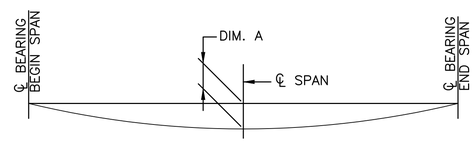
SHEET NO. S09 OF 19
TOTAL: 32
CAD FILE: 12089-S09-DETL
DRAWING FILE NO. 4-139-62

PRESTRESSED SLAB UNIT CAMBER AND OVERLAY NOTES:

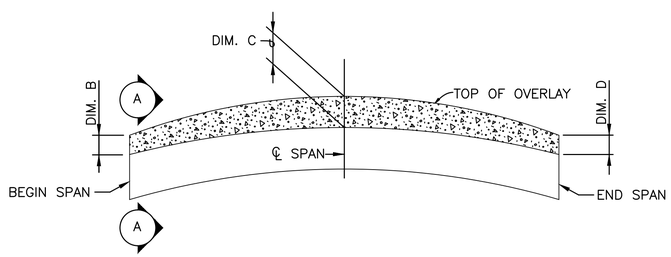
THE OVERLAY VALUES GIVEN IN THE TABLE ARE BASED ON THEORETICAL UNIT CAMBERS. THE CONTRACTOR SHALL MONITOR UNIT CAMBERS FOR THE PURPOSE OF PREDICTING CAMBER VALUES AT THE TIME OF THE DECK POUR. IF THE PREDICTED CAMBERS BASED ON FIELD MEASUREMENTS DIFFER MORE THAN ± 1/2" FROM THE THEORETICAL "NET UNIT CAMBER @ 120 DAYS" SHOWN IN THE TABLE, PROPOSE MODIFED OVERLAY DIMENSIONS AS REQUIRED AND SUBMIT TO THE ENGINEER FOR APPROVAL A MINIMUM OF 21 DAYS PRIOR TO CASTING OVERLAY CONCRETE.

OVERLAY & DEFLECTION DATA TABLE
FOR PRESTRESSED SLAB UNITS

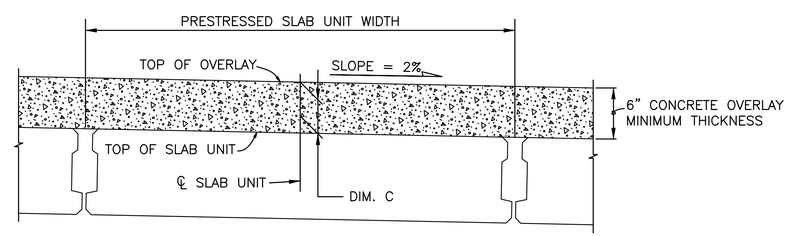
LOCATION	REQUIRED THEORETICAL BUILD-UP OVER ℄ UNIT			NET BEAM CAMBER (PRESTRESS – DEAD LOAD OF UNIT) @ 120 DAYS	DEAD LOAD DEFLECTION DURING DECK POUR @ 120 DAYS DIM A
BEAM NO.	AT BEGIN SPAN DIM B	AT ℄ SPAN DIM C	AT END SPAN DIM D		
PS-1 & PS-11	6"	10 3/4"	6"	1/4"	2 5/8"
PS-2 THRU PS-10	6"	10 3/4"	6"	1/4"	2 5/8"



DEAD LOAD DEFLECTION DIAGRAM



OVERLAY DIAGRAM FOR CREST VERTICAL CURVE SPANS - CONTROL AT BEGIN OR END SPAN ALONG ℄ SLAB UNIT



SECTION A-A
OVERLAY ON SLAB UNITS

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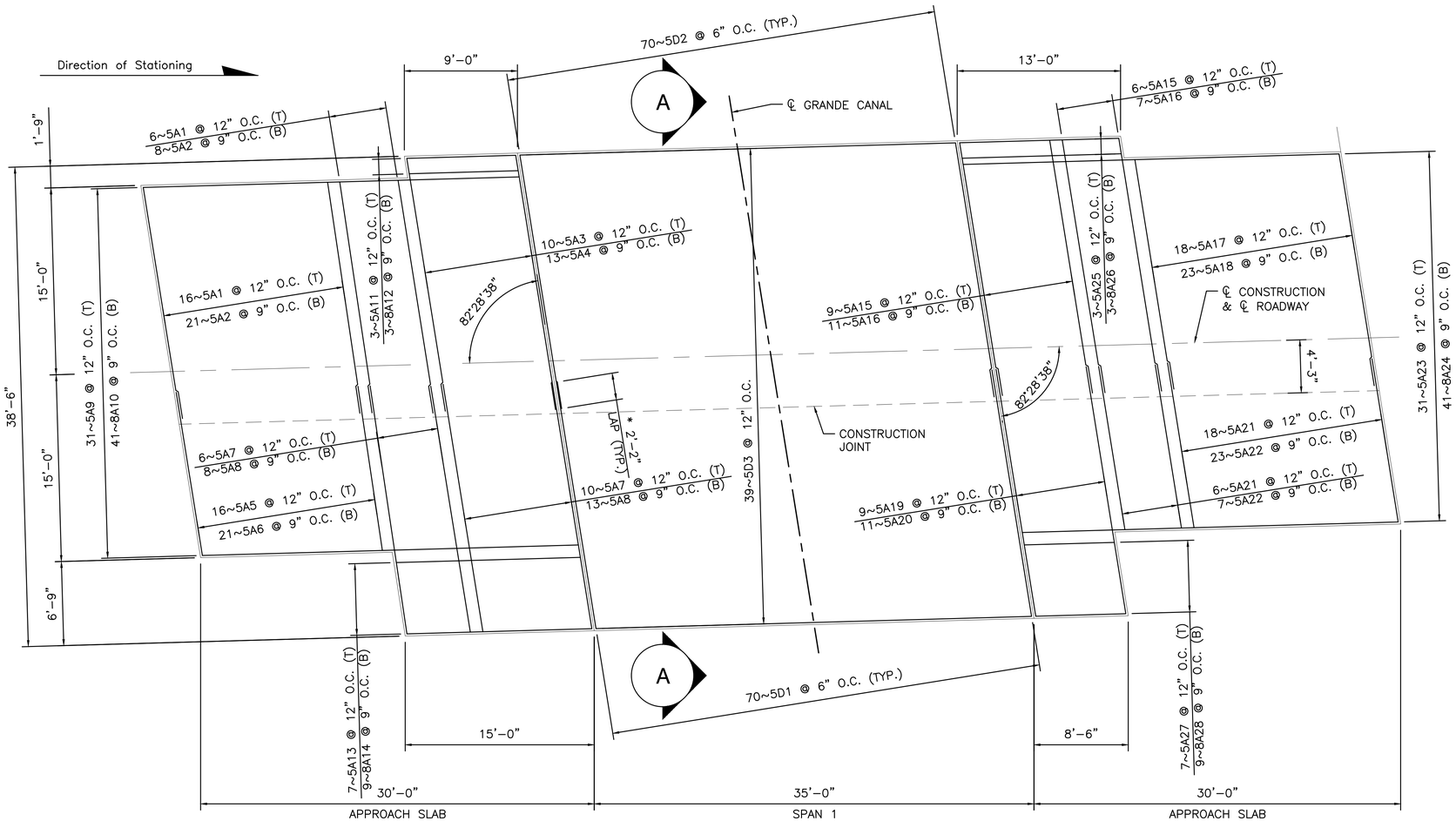
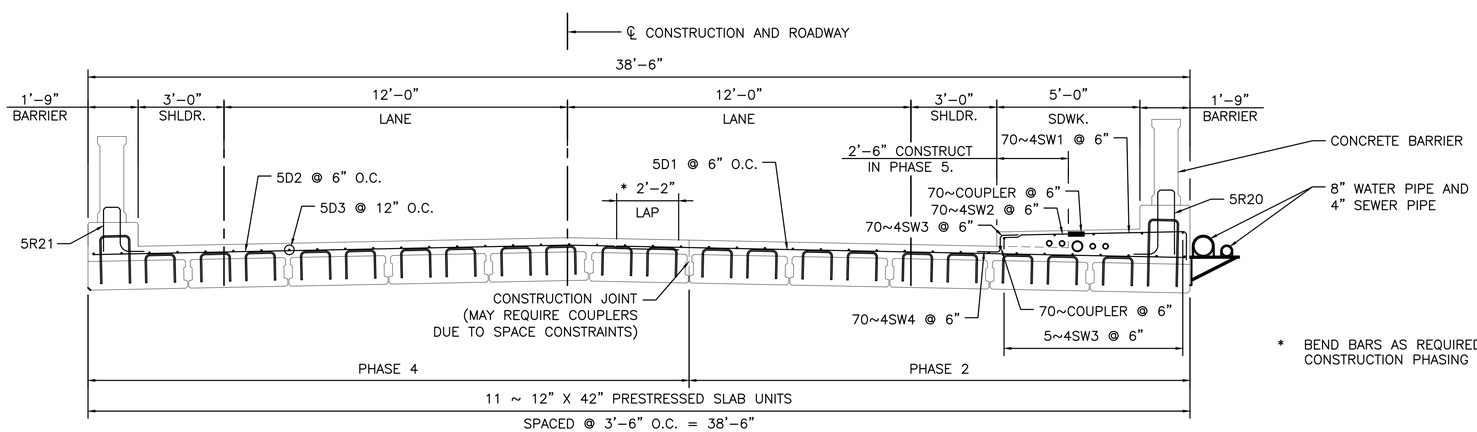
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FLAT SLAB DETAILS (4 OF 4)
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S10 OF 19
TOTAL: 32
CAD FILE: 12089-S10-DETL
DRAWING FILE NO. 4-139-62



DECK REINFORCING PLAN



SECTION A-A

NOTE:
CONCRETE COVER FOR CONCRETE DECK AND APPROACH SLAB IS 2".

* BEND BARS AS REQUIRED FOR CONSTRUCTION PHASING

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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
DECK REINFORCING PLAN
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S11	19

TOTAL: 32
CAD FILE: 12089-S11-PLAN
DRAWING FILE NO. 4-139-62

LOCATION: SUBSTRUCTURE (END BENT 1) — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
8	B1	40'–3"	11	1			40'–3"									
8	B2	42'–1"	9	18	1	1	40'–3"									
6	B3	13'–4"	43	4	4	4	3'–4"	2'–4"								
6	B4	11'–4"	12	4	4	4	3'–4"	1'–4"								
6	B5	40'–3"	6	1			40'–3"									
8	B6	4'–5"	6	18	1	1	2'–7"									
8	B7	4'–6"	3	17	4		3'–4"									
8	B8	7'–10"	3	17	4		6'–6"									
8	B9	22'–0"	11	1			22'–0"									
6	B10	22'–0"	14	1			22'–0"									
8	B11	4'–0"	11	1			4'–0"									
6	B12	3'–0"	6	1			3'–0"									

LOCATION: SUPERSTRUCTURE (DECK) — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
5	D1	20'–3"	70	1			20'–3"									
5	D2	20'–9"	70	1			20'–9"									
5	D3	34'–11½"	39	1			34'–11½"									
4	L	2'–0"	78	10			1'–0"	12								
5	S1	4'–10"	70	10			4'–0"	10								
5	S2	2'–7"	70	10			2'–3"	4								
5	S3	1'–4"	70	10			4"	12								
5	S4	1'–4"	70	10			4"	12								

LOCATION: SOUTH SEAWALL — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
5	C1	6'–0"	64	4	4	4	1'–4"	1'–2"								
5	C2	3'–10"	62	11			1'–2"	1'–4"	1'–4"							
5	C3	26'–2"	10	1			26'–2"									
5	C4	24'–0"	10	1			24'–0"									
5	C5	6'–0"	8	10			3'–0"	3'–0"								
5	C8	6'–10"	14	1			6'–10"									
5	C9	14'–4"	14	1			14'–4"									
5	C10	3'–1"	32	17	1		2'–6"									
5	C11	4'–6"	4	1			4'–6"									

LOCATION: NORTH SEAWALL — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
5	C1	6'–0"	64	4	4	4	1'–4"	1'–2"								
5	C2	3'–10"	62	11			1'–2"	1'–4"	1'–4"							
5	C3	26'–2"	10	1			26'–2"									
5	C4	24'–0"	10	1			24'–0"									
5	C5	6'–0"	8	10			3'–0"	3'–0"								
5	C6	9'–4"	14	1			9'–4"									
5	C7	6'–10"	14	1			6'–10"									
5	C10	3'–1"	32	17	1		2'–6"									
5	C11	4'–6"	4	1			4'–6"									

LOCATION: SUBSTRUCTURE (END BENT 2) — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
8	B1	40'–3"	11	1			40'–3"									
8	B2	42'–1"	9	18	1	1	40'–3"									
6	B3	13'–4"	43	4	4	4	3'–4"	2'–4"								
6	B4	11'–4"	12	4	4	4	3'–4"	1'–4"								
6	B5	40'–3"	6	1			40'–3"									
8	B6	4'–5"	6	18	1	1	2'–7"									
8	B7	4'–8"	3	17	4		3'–4"									
8	B8	7'–10"	3	17	4		6'–6"									
8	B9	22'–0"	11	1			22'–0"									
6	B10	22'–0"	14	1			22'–0"									
4	B11	4'–0"	11	1			4'–0"									
6	B12	3'–0"	6	1			3'–0"									

LOCATION: SUPERSTRUCTURE (APPROACH SLAB) — No. REQUIRED: 1

SIZE	MARK	LENGTH	NO. BARS REQ'D	TYPE	STYLE A	STYLE G	B	C	D	E	F	H	J	K	N	ϕ
5	A1	18'–9"	22	1			18'–9"									
5	A2	18'–9"	29	1			18'–9"									
5	A3	20'–6"	10	1			20'–6"									
5	A4	20'–6"	13	1			20'–6"									
5	A5	13'–3"	16	1			13'–3"									
5	A6	13'–3"	21	1			13'–3"									
5	A7	20'–2"	16	1			20'–2"									
5	A8	20'–2"	21	1			20'–2"									
5	A9	30'–2"	31	1			30'–2"									
8	A10	30'–2"	41	1			30'–2"									
5	A11	8'–9"	3	1			8'–9"									
8	A12	8'–9"	3	1			8'–9"									
5	A13	14'–10"	7	1			14'–10"									
8	A14	14'–10"	9	1			14'–10"									
5	A15	20'–6"	15	1			20'–6"									
5	A16	20'–6"	18	1			20'–6"									
5	A17	18'–9"	18	1			18'–9"									
5	A18	18'–9"	23	1			18'–9"									
5	A19	20'–2"	9	1			20'–2"									
5	A20	20'–2"	11	1			20'–2"									
5	A21	13'–3"	24	1			13'–3"									
5	A22	13'–3"	30	1			13'–3"									
5	A23	30'–2"	31	1			30'–2"									
8	A24	30'–2"	41	1			30'–2"									
5	A25	12'–9"	3	1			12'–9"									
8	A26	12'–9"	3	1			12'–9"									
5	A27	7'–2"	7	1			7'–2"									
8	A28	7'–2"	9	1			7'–2"									

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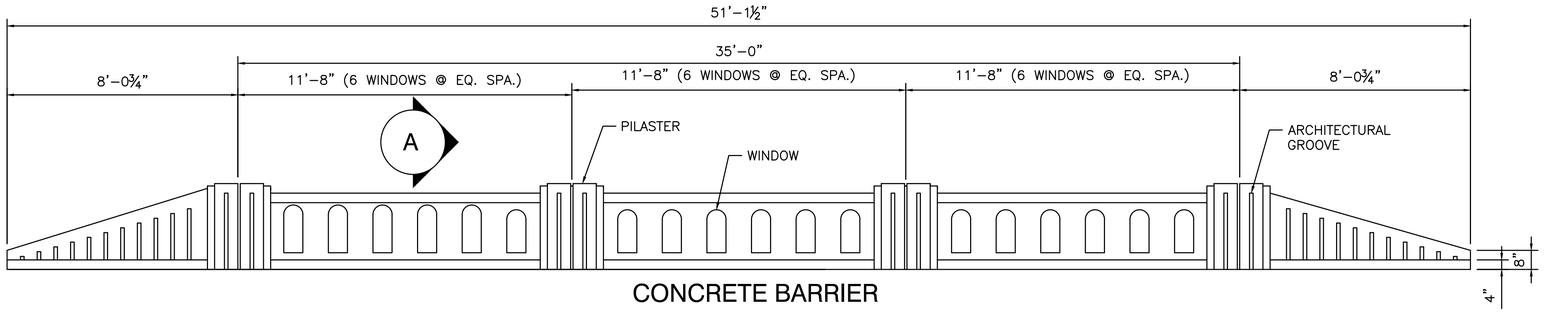
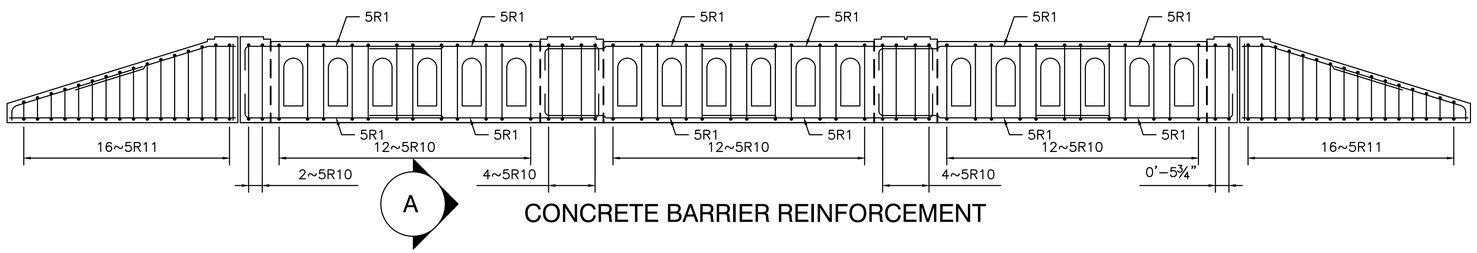
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
REINFORCEMENT TABLE
COCONUT ISLE DRIVE OVER GRANDE CANAL

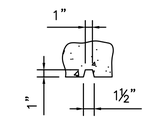
SHEET NO. S12 OF 19
TOTAL: 32
CAD FILE: 12089–S12–REIN
DRAWING FILE NO. 4–139–62



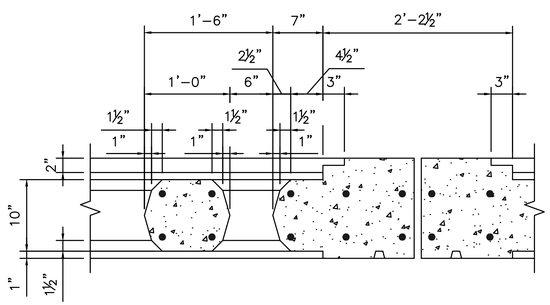
CONCRETE BARRIER



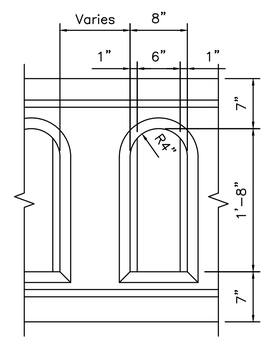
CONCRETE BARRIER REINFORCEMENT



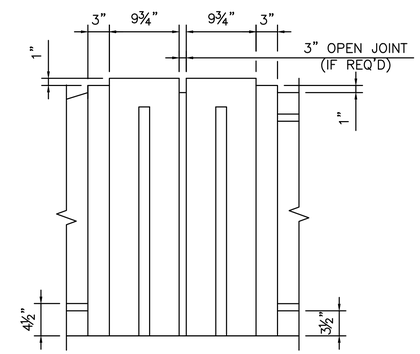
ARCHITECTURAL GROOVE DETAIL



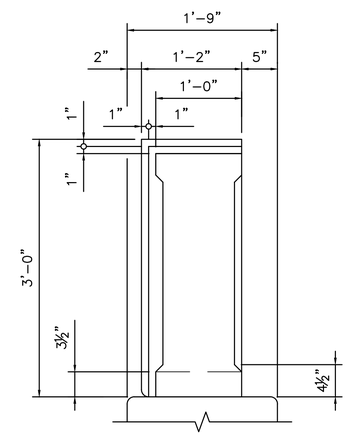
WINDOW DETAIL



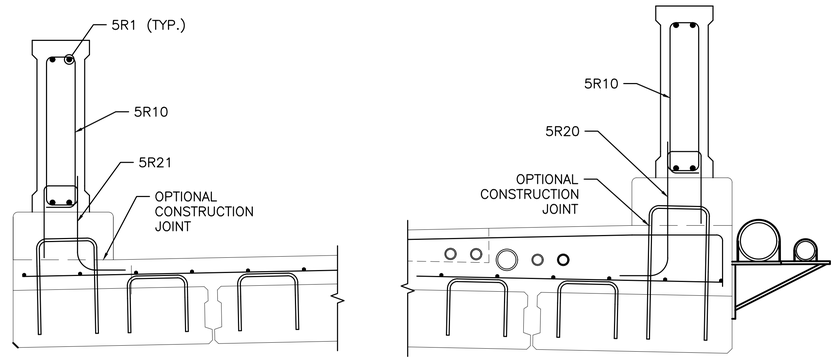
WINDOW DETAIL



PILASTER DETAIL



PILASTER DETAIL



WEST SIDE

EAST SIDE

SECTION A-A

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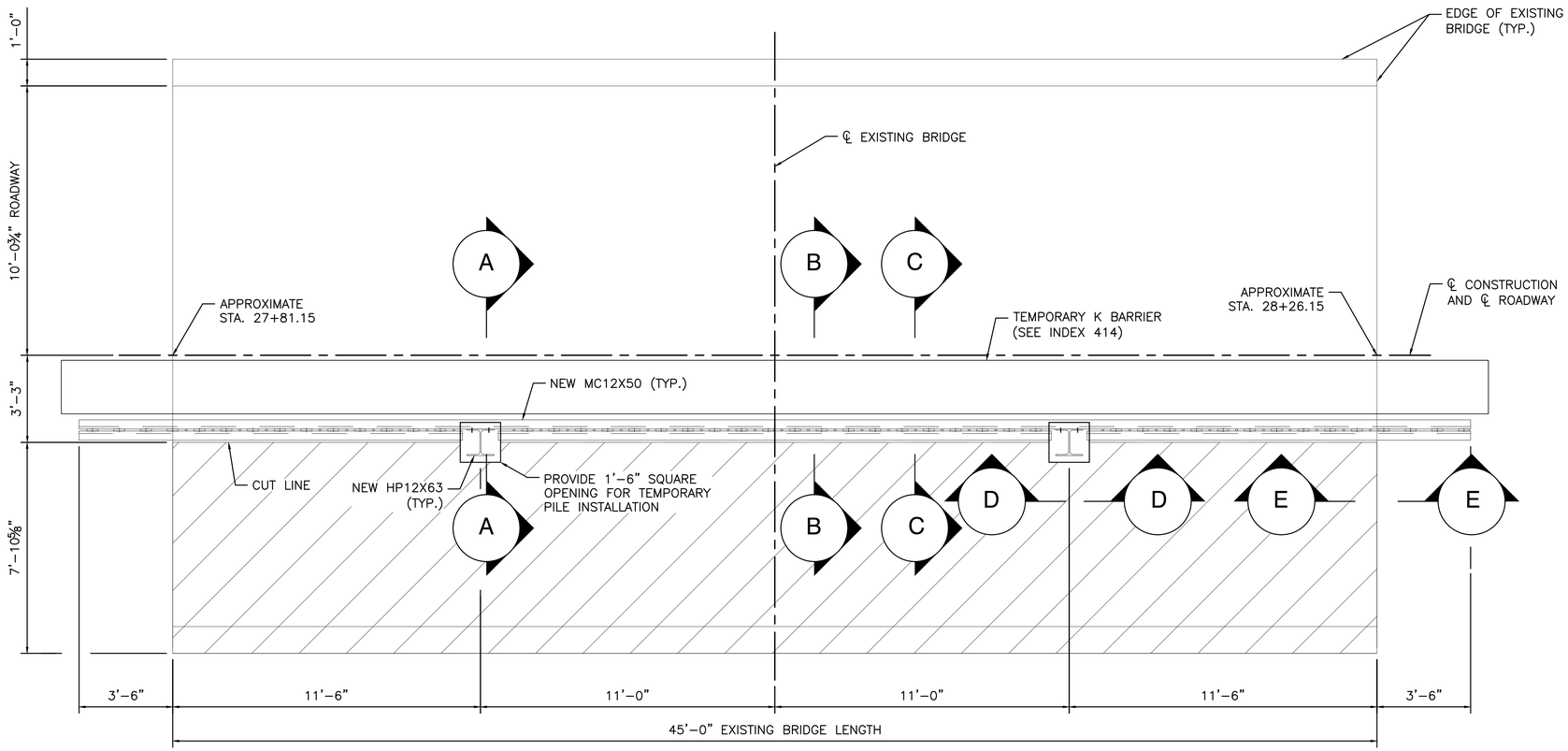
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
BARRIER PLAN AND SECTIONS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S13 OF 19
TOTAL: 32
CAD FILE: 12089-S13-DETL
DRAWING FILE NO. 4-139-62



PLAN OF EXISTING BRIDGE

LEGEND:

REMOVAL LIMITS (SEE SHEET NO. G09 FOR CONSTRUCTION PHASING)

NOTES

1. DRIVE HP 12X63 TO A MINIMUM NOMINAL BEARING RESISTANCE (NBR) OF 95 TONS. MINIMUM PILE TIPE ELEVATION FOR LATERAL STABILITY SHALL BE (–)30 FT.
2. FOR SECTIONS A–A, B–B, C–C, D–D, & E–E, SEE SHEET NO. S15.

Hardesty & Hanover
1000 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119

ENGINEER:
RONALD SANCHEZ
REG. No: 58923
DATE: 09/25/15
TEL: (954) 835-0119
FAX: (954) 835-0130

DRAWN BY:	DATE:
TB	09/27/18
DESIGNED BY:	SCALE:
RS	
CHECKED BY:	
CG	
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

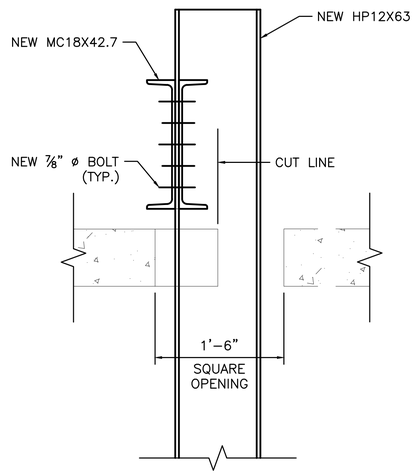
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TEMPORARY SUPPORT P&E
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S14	19

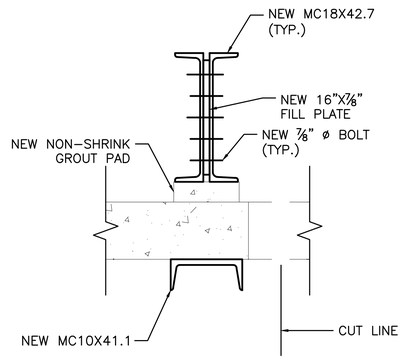
TOTAL: 32

CAD FILE: 12089–S14–TEMP

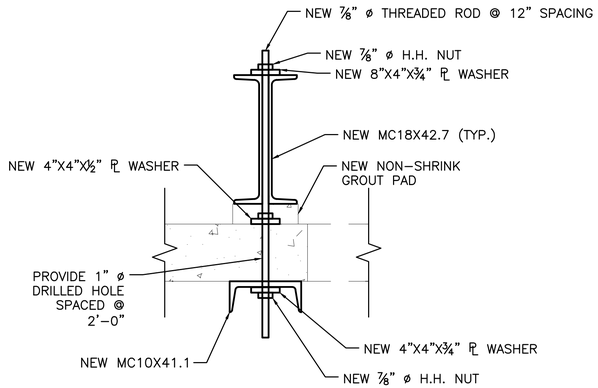
DRAWING FILE NO. 4–139–62



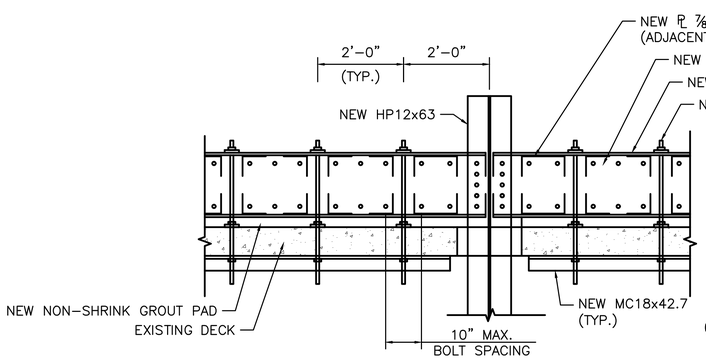
SECTION A-A
(TEMPORARY BARRIER NOT SHOWN)



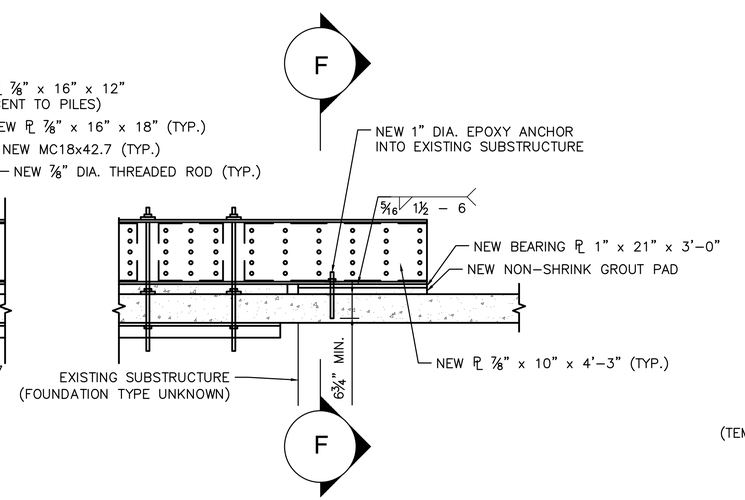
SECTION B-B
(TEMPORARY BARRIER NOT SHOWN)



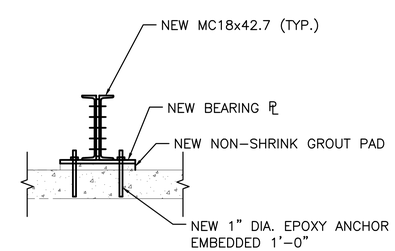
SECTION C-C
(TEMPORARY BARRIER NOT SHOWN)



SECTION D-D



SECTION E-E



SECTION F-F
(TEMPORARY BARRIER NOT SHOWN)

Hardesty & Hanover
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(954) 835-9119

ENGINEER:
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DRAWN BY:	DATE:
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RS	
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CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

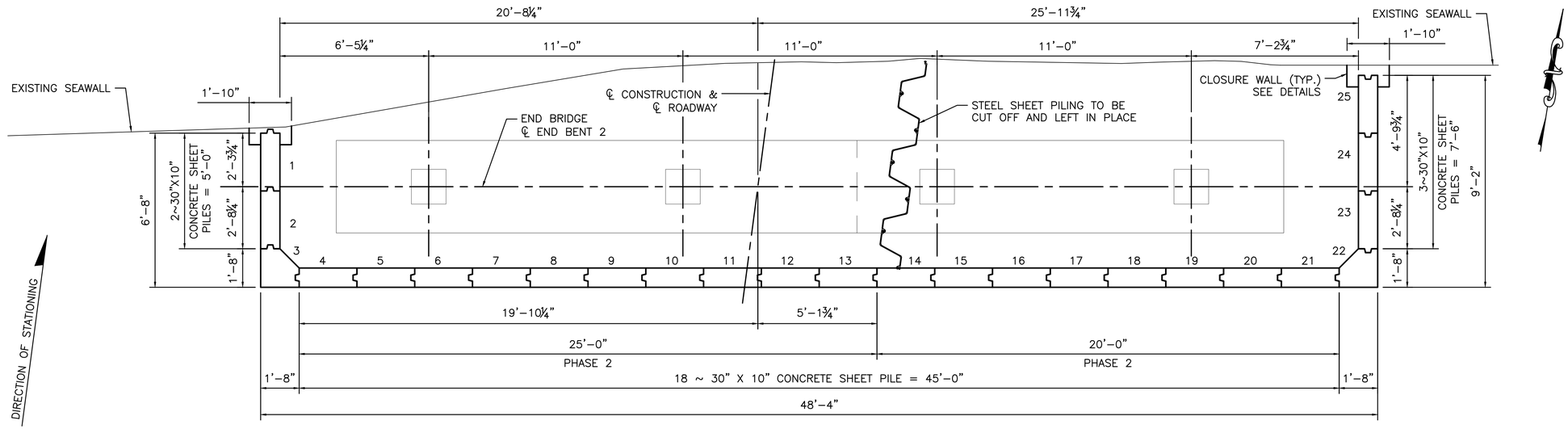
REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TEMPORARY SUPPORT DETAILS
COCONUT ISLE DRIVE OVER GRANDE CANAL

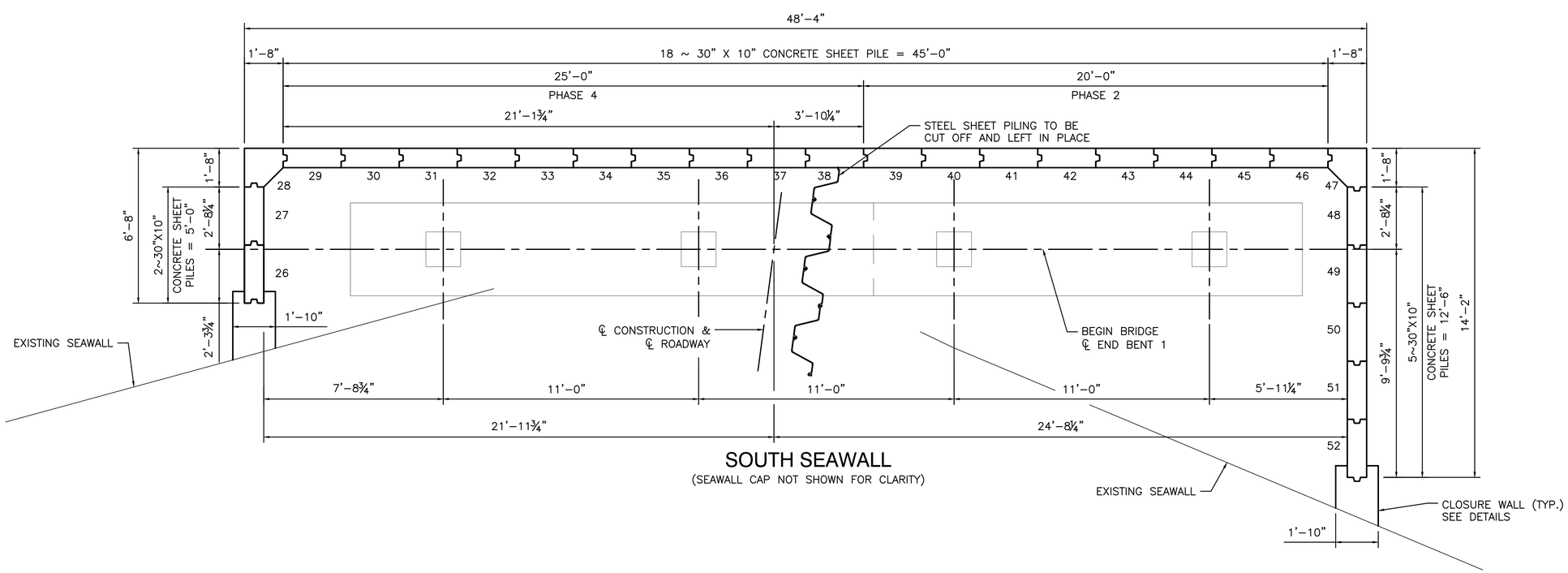
SHEET NO.	OF
S15	19

TOTAL: 32
CAD FILE: 12089-S15-TEMP
DRAWING FILE NO. 4-139-62



NORTH SEAWALL

(SEAWALL CAP NOT SHOWN FOR CLARITY)



SOUTH SEAWALL

(SEAWALL CAP NOT SHOWN FOR CLARITY)

NOTES:
1. WORK THIS SHEET WITH STANDARD INDEX NO. 6040.
2. WORK THIS SHEET WITH SHEET NOS. S17 AND S18.

Hardesty &Hanover
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ENGINEER:
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DATE: 09/25/15
TEL: (954) 835-0119
FAX: (954) 835-0130

DRAWN BY:	DATE:	09/27/18
TB	DESIGNED BY:	SCALE:
	RS	
	CHECKED BY:	
	CG	
	FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

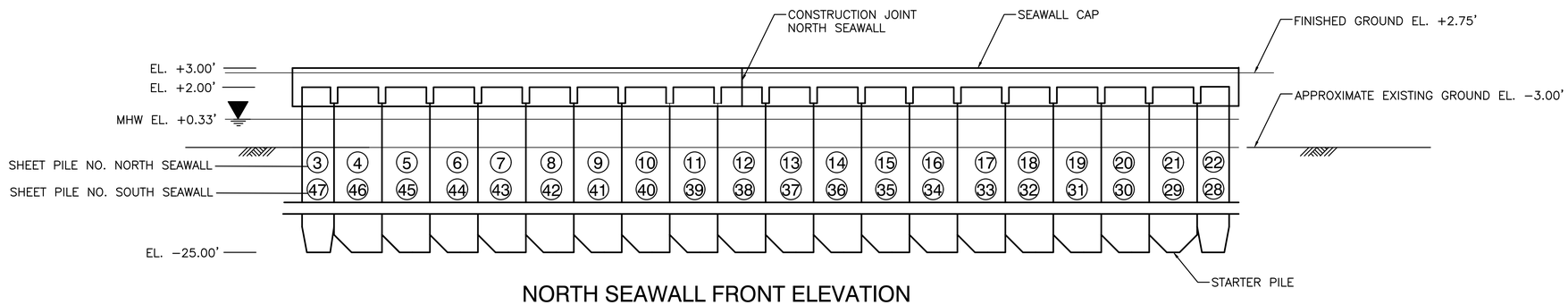
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SEAWALL PLAN
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S16	19

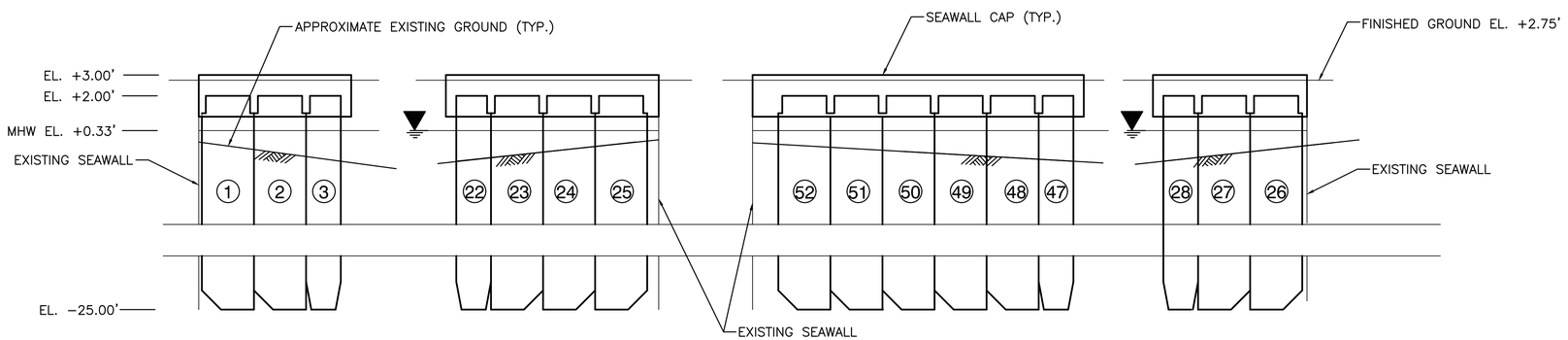
TOTAL: 32

CAD FILE: 12089-S16-SEAW

DRAWING FILE NO. 4-139-62



NORTH SEAWALL FRONT ELEVATION
SOUTH SEAWALL OPPOSITE HAND



WEST ELEVATION EAST ELEVATION
NORTH SEAWALL SIDE ELEVATIONS

EAST ELEVATION WEST ELEVATION
SOUTH SEAWALL SIDE ELEVATIONS

NOTES:

1. EXISTING GROUND ELEVATIONS ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY AND NOTIFY ENGINEER IF EXISTING GROUND EL. IS −7.0 FT OR LOWER.
2. SEE SHEET NO. S16 FOR CONSTRUCTION JOINT LOCATION.

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RS	
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CG	
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

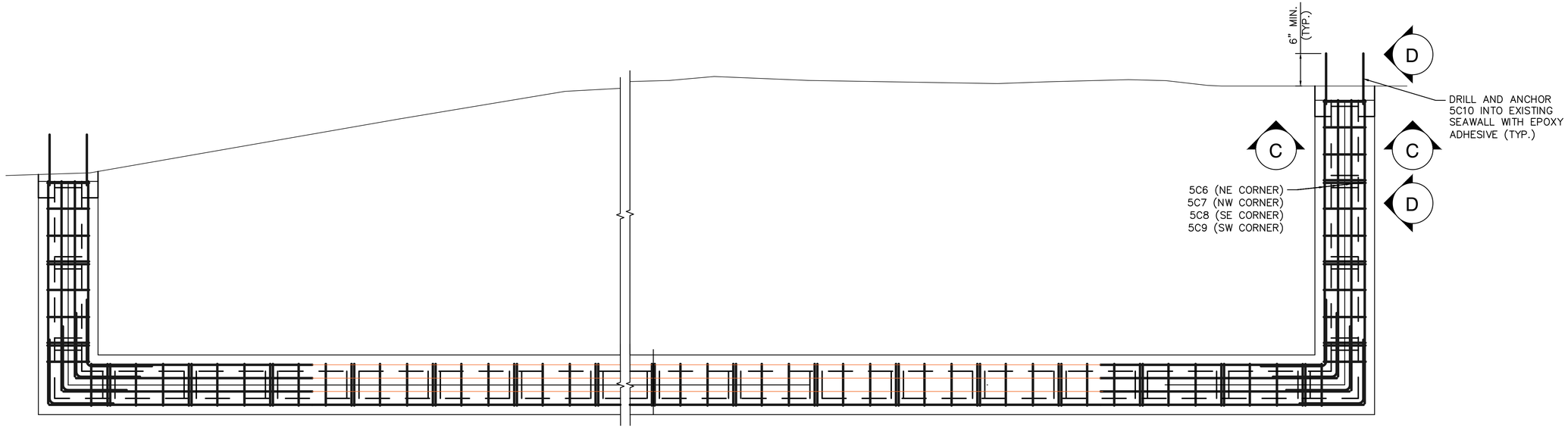
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SEAWALL ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S17	19

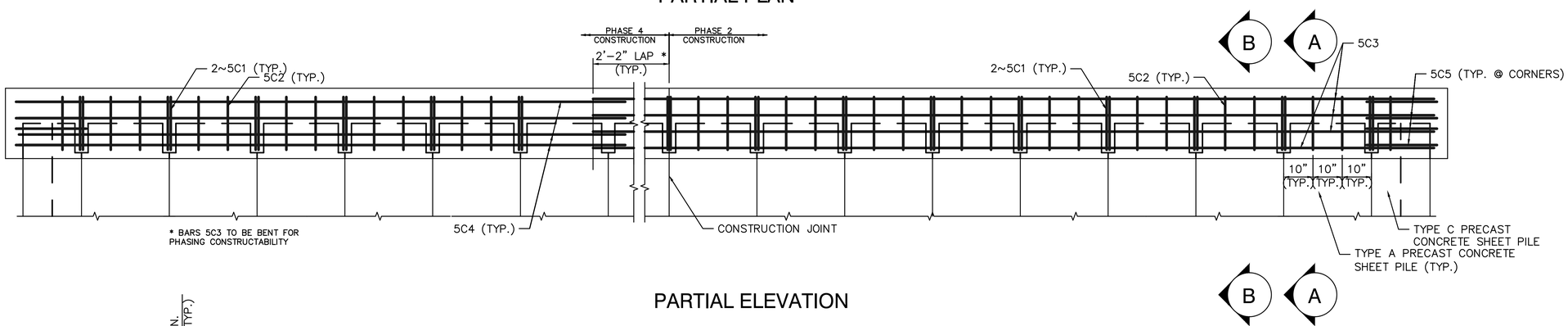
TOTAL: 32

CAD FILE: 12089−S17−SEAW

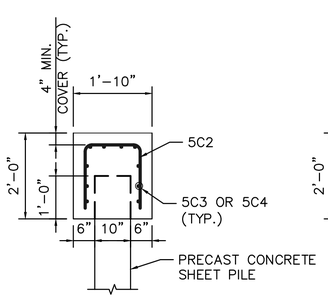
DRAWING FILE NO. 4−139−62



PARTIAL PLAN

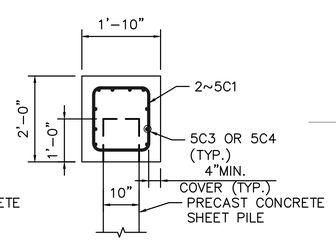


PARTIAL ELEVATION



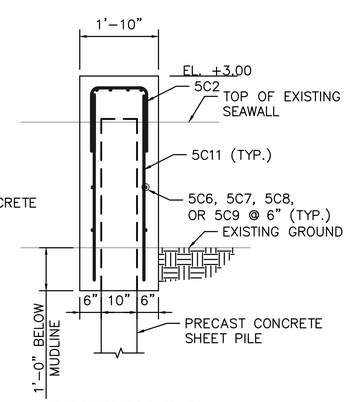
TYPICAL SECTION

SECTION A-A

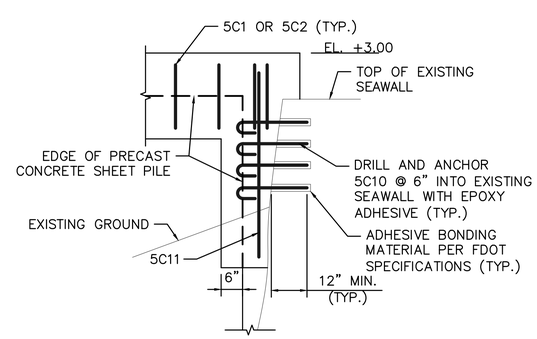


TYPICAL SECTION AT PILE SLOT

SECTION B-B



SECTION C-C



VIEW D-D

NOTES:
1. FOR BAR SCHEDULE, SEE SHEET NO. S12.

Hardesty &Hanover
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TB	09/27/18
DESIGNED BY:	SCALE:
RS	
CHECKED BY:	
CG	
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SEAWALL DETAILS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S18	19

TOTAL: 32

CAD FILE: 12089-S18-SEAW

DRAWING FILE NO. 4-139-62

LOAD RATING SUMMARY DETAILS FOR PRESTRESSED CONCRETE BRIDGES (FLAT SLAB AND DECK/GIRDER) — TABLE DATE 07–01–15

TABLE 1 – LRFR

LEVEL	LIMIT STATE	VEHICLE	WEIGHT (TONS)	LOAD FACTORS			MOMENT (STRENGTH)					SHEAR (STRENGTH)					COMMENTS: INTERIOR/EXTERIOR BEAM DF METHOD IF OTHER THAN LRFD. OTHER APPROPIATE COMMENTS.
				LL	DC	DW	DISTRIBUTION FACTOR (DF)	RATING FACTOR	TONS	LOCATION	DIMENSION	DISTRIBUTION FACTOR (DF)	RATING FACTOR	TONS	LOCATION	DIMENSION	
DESIGN LOAD RATING	STRENGTH I (INV)	HL–93	N/A	1.75	1.25	1.50	0.29	2.28	N/A	"A"	16.75'	0.64	1.16	N/A	"B"	AT BEARING	EXTERIOR BEAMS
	STRENGTH I (OP)	HL–93	N/A	1.35	1.25	1.50	0.29	2.96	N/A	"A"	16.75'	0.64	1.50	N/A	"B"	AT BEARING	EXTERIOR BEAMS
	STRENGTH III (INV)	HL–93	N/A	0.80	1.00	1.00	0.29	1.52	N/A	"A"	16.75'	N/A	N/A	N/A	N/A	N/A	EXTERIOR BEAMS
PERMIT LOAD RATING	STRENGTH II	FL120	60.0	1.35	1.25	1.50	0.29	2.36	141.61	"A"	13.25'	0.64	1.04	62.3	"B"	AT BEARING	EXTERIOR BEAMS

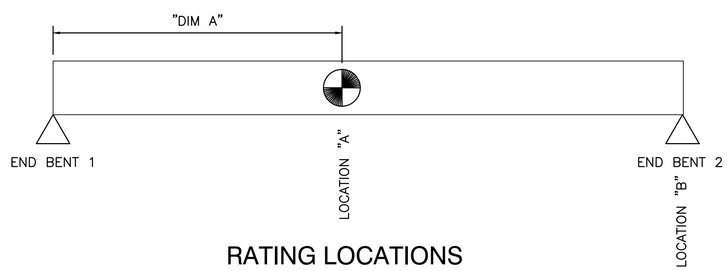
ABBREVIATIONS:

INV – INVENTORY

OP – OPERATING

GENERAL NOTES:
1. THIS TABLE IS BASED ON THE REQUIREMENTS ESTABLISHED IN THE JANUARY 2018 "STRUCTURES MANUAL".
2. RATING WAS PERFORMED WITH LEAP CONSPAN V8i VERSION 14.00.00.19.

TABLE 2 NOTES:
1. PERMIT CAPACITY IS DETERMINED BY USING THE PERMIT VEHICLE IN ALL LANES.
2. HAS THE AASHTO LRFD SPECIFICATIONS ARTICLE 5.8.3.5 LONGITUDINAL REINFORCEMENT BEEN SATISFIED?
☒YES ☐ NO



RATING LOCATIONS

Hardesty &Hanover
1000 SAWGRASS CORPORATE PARKWAY
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(954) 835-9119

ENGINEER:
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DRAWN BY: TB
DATE: 09/27/18
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SCALE:
CHECKED BY: CG
FIELD BOOK:

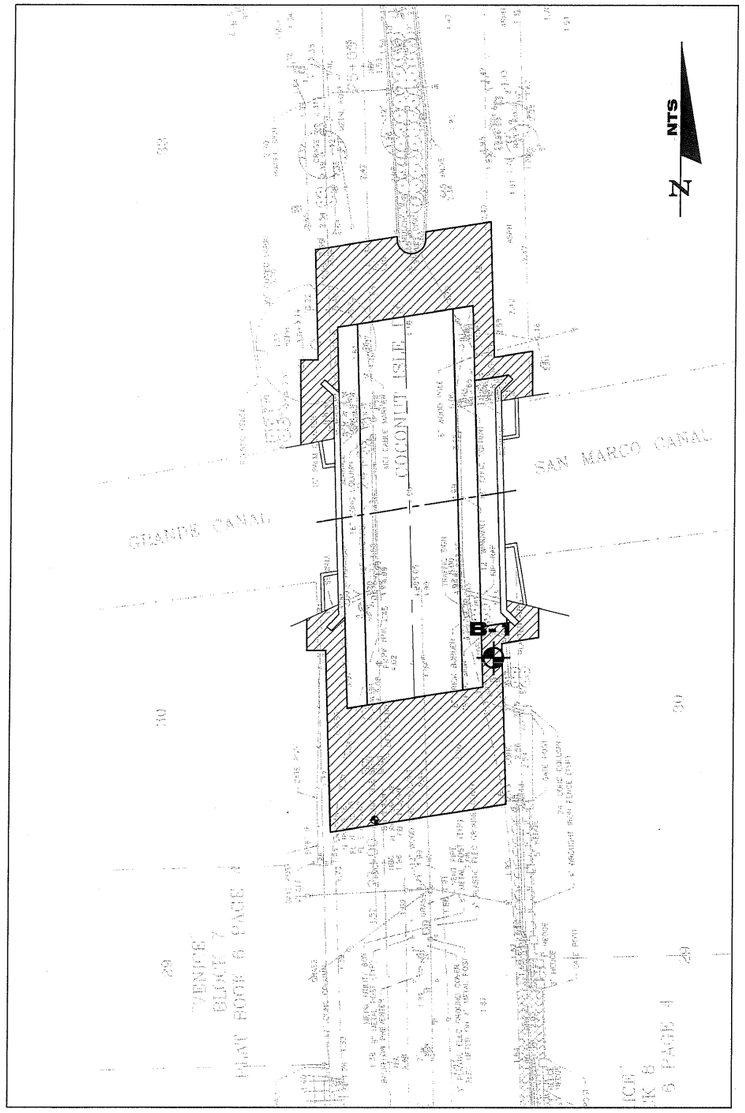
CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

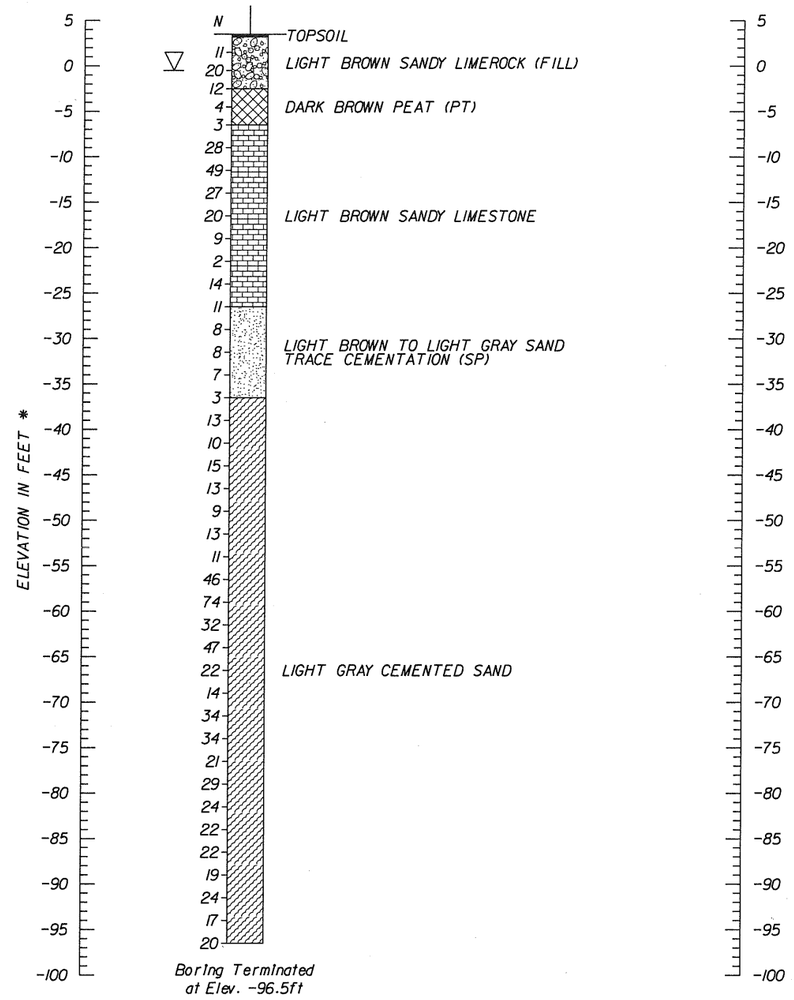
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
LOAD RATING
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S19 OF 19
TOTAL: 32
CAD FILE: 12089–S19–LOAD
DRAWING FILE NO. 4–139–62



BOR # B-1
STA. 23+50.00 BL Survey*
OFF. 28.0' RT*
ELEV. 3.5*
DATE 8/11/2015
HAMMER Safety
RIG D-25
NORTHING 650034.621
EASTING 944370.205



Topsoil
Sandy Gravel
Peat
Limestone Hard
Sand
Coquina

NOTES:

▽ ENCOUNTERED WATER TABLE DURING DRILLING

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION. (UNLESS OTHERWISE NOTED.)

MC=	NATURAL MOISTURE CONTENT (%)
-200=	FINES PASSING #200 SIEVE (%)
OC=	ORGANIC CONTENT (%)
LL=	LIQUID LIMIT (%)
PI=	PLASTICITY INDEX (%)
NP=	INDICATES NON-PLASTIC
WOH=	WEIGHT OF HAMMER

STRATA BOUNDARIES ARE APPROXIMATE AND MAY VARY BETWEEN OR AWAY FROM BORING LOCATIONS.

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.375 Inches
SPOON OUTSIDE DIA.	2.0 Inches
AVG. HAMMER DROP	30.0 Inches
HAMMER WEIGHT	140.0 pounds

SPT CONSISTENCY CHART

SILTS AND CLAYS

CONSISTENCY	SAFETY HAMMER SPT N-VALUE (BLOW/FOOT)	AUTOMATIC HAMMER SPT N-VALUE (BLOW/FOOT)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 - 4	1 - 3
FIRM	4 - 8	3 - 6
STIFF	8 - 15	6 - 12
VERY STIFF	15 - 30	12 - 24
HARD	GREATER THAN 30	GREATER THAN 24

SPT DENSITY CHART

GRANULAR MATERIALS

RELATIVE DENSITY	SAFETY HAMMER SPT N-VALUE (BLOW/FOOT)	AUTOMATIC HAMMER SPT N-VALUE (BLOW/FOOT)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 - 10	3 - 8
MEDIUM	10 - 30	8 - 24
DENSE	30 - 50	24 - 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

RAJ KRISHNASAMY, P.E.
P.E. LICENSE NUMBER 53567
TIERRA SOUTH FLORIDA
2765 VISTA PARKWAY, S-10
WEST PALM BEACH, FL 33411
CERTIFICATE OF AUTHORIZATION 28073

DRAWN BY: JO 11-15
CHECKED BY: MP 11-15
DESIGNED BY: KV 11-15
CHECKED BY: RK 11-15

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
	BROWARD	

SHEET TITLE: REPORT OF CORE BORINGS

REF. DWG. NO.

PROJECT NAME: COCONUT ISLES BRIDGE

SHEET NO.

CAM 19-0085

Exhibit 2

jolva 11/24/2015 1:50:44 PM J:\Tierra Documents\Projects\TSF 2015\111-15-314.Coconut Isles Bridge (Hardesty)\borings.DGN

CITY OF FORT LAUDERDALE
GENERAL CONDITIONS

These instructions are standard for all contracts for commodities or services issued through the City of Fort Lauderdale Procurement Services Division. The City may delete, supersede, or modify any of these standard instructions for a particular contract by indicating such change in the Invitation to Bid (ITB) Special Conditions, Technical Specifications, Instructions, Proposal Pages, Addenda, and Legal Advertisement. In this general conditions document, Invitation to Bid (ITB), Request for Qualifications (RFQ), and Request for Proposal (RFP) are interchangeable.

PART I BIDDER PROPOSAL PAGE(S) CONDITIONS:

1.01 **BIDDER ADDRESS**: The City maintains automated vendor address lists that have been generated for each specific Commodity Class item through our bid issuing service, BidSync. Notices of Invitations to Bid (ITB'S) are sent by e-mail to the selection of bidders who have fully registered with BidSync or faxed (if applicable) to every vendor on those lists, who may then view the bid documents online. Bidders who have been informed of a bid's availability in any other manner are responsible for registering with BidSync in order to view the bid documents. There is no fee for doing so. If you wish bid notifications be provided to another e-mail address or fax, please contact BidSync. If you wish purchase orders sent to a different address, please so indicate in your bid response. If you wish payments sent to a different address, please so indicate on your invoice.

1.02 **DELIVERY:** Time will be of the essence for any orders placed as a result of this ITB. The City reserves the right to cancel any orders, or part thereof, without obligation if delivery is not made in accordance with the schedule specified by the Bidder and accepted by the City.

1.03 **PACKING SLIPS:** It will be the responsibility **of** the awarded Contractor, to attach all packing slips to the OUTSIDE of each shipment. Packing slips must provide a detailed description of what is to be received and reference the City of Fort Lauderdale purchase order number that is associated with the shipment. Failure to provide a detailed packing slip attached to the outside of shipment may result in refusal of shipment at Contractor's expense.

1.04 **PAYMENT TERMS AND CASH DISCOUNTS:** Payment terms, unless otherwise stated in this ITB, will be considered to be net 45 days after the date of satisfactory delivery at the place of acceptance and receipt of correct invoice at the office specified, whichever occurs last. Bidder may offer cash discounts for prompt payment but they will not be considered in determination of award. If a Bidder offers a discount, it is understood that the discount time will be computed from the date of satisfactory delivery, at the place of acceptance, and receipt of correct invoice, at the office specified, whichever occurs last.

1.05 **TOTAL BID DISCOUNT:** If Bidder offers a discount for award of all items listed in the bid, such discount shall be deducted from the total of the firm net unit prices bid and shall be considered in tabulation and award of bid.

1.06 **BIDS FIRM FOR ACCEPTANCE:** Bidder warrants, by virtue of bidding, that the bid and the prices quoted in the bid will be firm for acceptance by the City for a period of one hundred twenty (120) days from the date of bid opening unless otherwise stated in the ITB.

1.07 **VARIANCES:** For purposes of bid evaluation, Bidder's must indicate any variances, no matter how slight, from ITB General Conditions, Special Conditions, Specifications or Addenda in the space provided in the ITB. No variations or exceptions by a Bidder will be considered or deemed a part of the bid submitted unless such variances or exceptions are listed in the bid and referenced in the space provided on the bidder proposal pages. If variances are not stated, or referenced as required, it will be assumed that the product or service fully complies with the City's terms, conditions, and specifications.

By receiving a bid, City does not necessarily accept any variances contained in the bid. All variances submitted are subject to review and approval by the City. If any bid contains material variances that, in the City's sole opinion, make that bid conditional in nature, the City reserves the right to reject the bid or part of the bid that is declared, by the City as conditional.

1.08 **NO BIDS:** If you do not intend to bid please indicate the reason, such as insufficient time to respond, do not offer product or service, unable to meet specifications, schedule would not permit, or any other reason, in the space provided in this ITB. Failure to bid or return no bid comments prior to the bid due and opening date and time, indicated in this ITB, may result in your firm being deleted from our Bidder's registration list for the Commodity Class Item requested in this ITB.

1.09 MINORITY AND WOMEN BUSINESS ENTERPRISE PARTICIPATION AND BUSINESS DEFINITIONS: The City of Fort Lauderdale wants to increase the participation of Minority Business Enterprises (MBE), Women Business Enterprises (WBE), and Small Business Enterprises (SBE) in its procurement activities. If your firm qualifies in accordance with the below definitions please indicate in the space provided in this ITB.

Minority Business Enterprise (MBE) "A Minority Business" is a business enterprise that is owned or controlled by one or more socially or economically disadvantaged persons. Such disadvantage may arise from cultural, racial, chronic economic circumstances or background or other similar cause. Such persons include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

The term "Minority Business Enterprise" means a business at least 51 percent of which is owned by minority group members or, in the case of a publicly owned business, at least 51 percent of the stock of which is owned by minority group members. For the purpose of the preceding sentence, minority group members are citizens of the United States who include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

Women Business Enterprise (WBE) a "Women Owned or Controlled Business" is a business enterprise at least 51 percent of which is owned by females or, in the case of a publicly owned business, at least 51 percent of the stock of which is owned by females.

Small Business Enterprise (SBE) "Small Business" means a corporation, partnership, sole proprietorship, or other legal entity formed for the purpose of making a profit, which is independently owned and operated, has either fewer than 100 employees or less than $1,000,000 in annual gross receipts.

BLACK, which includes persons having origins in any of the Black racial groups of Africa.
WHITE, which includes persons whose origins are Anglo-Saxon and Europeans and persons of Indo-European decent including Pakistani and East Indian.
HISPANIC, which includes persons of Mexican, Puerto Rican, Cuban, Central and South American, or other Spanish culture or origin, regardless of race.
NATIVE AMERICAN, which includes persons whose origins are American Indians, Eskimos, Aleuts, or Native Hawaiians.
ASIAN AMERICAN, which includes persons having origin in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.

1.10 MINORITY-WOMEN BUSINESS ENTERPRISE PARTICIPATION

It is the desire of the City of Fort Lauderdale to increase the participation of minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the City does not have any preference or set aside programs in place, it is committed to a policy of equitable participation for these firms. Proposers are requested to include in their proposals a narrative describing their past accomplishments and intended actions in this area. If proposers are considering minority or women owned enterprise participation in their proposal, those firms, and their specific duties have to be identified in the proposal. If a proposer is considered for award, he or she will be asked to meet with City staff so that the intended MBE/WBE participation can be formalized and included in the subsequent contract.

1.11 <u>SCRUTINIZED COMPANIES</u>

Subject to *Odebrecht Construction, Inc., v. Prasad*, 876 F.Supp.2d 1305 (S.D. Fla. 2012), *affirmed*, *Odebrecht Construction, Inc., v. Secretary, Florida Department of Transportation*, 715 F.3d 1268 (11th Cir. 2013), with regard to the "Cuba Amendment," the Contractor certifies that it is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2018), that it is not engaged in a boycott of Israel, and that it does not have business operations in Cuba or Syria, as provided in section 287.135, Florida Statutes (2018), as may be amended or revised. The City may terminate this Agreement at the City's option if the Contractor is found to have submitted a false certification as provided under subsection (5) of section 287.135, Florida Statutes (2018), as may be amended or revised, or been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2018), or is engaged in a boycott of Israel or has been engaged in business operations

in Cuba or Syria, as defined in Section 287.135, Florida Statutes (2018), as may be amended or revised.

1.12 DEBARRED OR SUSPENDED BIDDERS OR PROPOSERS

The bidder or proposer certifies, by submission of a response to this solicitation, that neither it nor its principals and subcontractors are presently debarred or suspended by any Federal department or agency.

Part II DEFINITIONS/ORDER OF PRECEDENCE:

2.01 BIDDING DEFINITIONS The City will use the following definitions in its general conditions, special conditions, technical specifications, instructions to bidders, addenda and any other document used in the bidding process:

INVITATION TO BID (ITB) The solicitation document used for soliciting competitive sealed bids for goods or services.
INVITATION TO NEGOTIATE (ITN) All solicitation documents, regardless of medium, whether attached to or incorporated by reference in solicitations for responses from firms that invite proposals from interested and qualified firms so the city may enter into negotiations with the firm(s) determined most capable of providing the required goods or services.
REQUEST FOR PROPOSALS (RFP) A solicitation method used for soliciting competitive sealed proposals to determine the best value among proposals for goods or services for which price may not be the prevailing factor in award of the contract, or the scope of work, specifications or contract terms and conditions may be difficult to define. Such solicitation will consider the qualifications of the proposers along with evaluation of each proposal using identified and generally weighted evaluation criteria. RFPs may include price criteria whenever feasible, at the discretion of the city.
REQUEST FOR QUALIFICATIONS (RFQ) A solicitation method used for requesting statements of qualifications in order to determine the most qualified proposer for professional services.
BID – a price and terms quote received in response to an ITB.
PROPOSAL – a proposal received in response to an RFP.
BIDDER – Person or firm submitting a Bid.
PROPOSER – Person or firm submitting a Proposal.
RESPONSIVE BIDDER – A firm who has submitted a bid, offer, quote, or response which conforms in all material respects to the competitive solicitation document and all of its requirements.
RESPONSIBLE BIDDER – A firm who is fully capable of meeting all requirements of the solicitation and subsequent contract. The respondent must possess the full capability, including financial and technical, ability, business judgment, experience, qualifications, facilities, equipment, integrity, capability, and reliability, in all respects to perform fully the contract requirements and assure good faith performance as determined by the city.
FIRST RANKED PROPOSER – That Proposer, responding to a City RFP, whose Proposal is deemed by the City, the most advantageous to the City after applying the evaluation criteria contained in the RFP.
SELLER – Successful Bidder or Proposer who is awarded a Purchase Order or Contract to provide goods or services to the City.
CONTRACTOR – Any firm having a contract with the city. Also referred to as a "Vendor".
CONTRACT – All types of agreements, including purchase orders, for procurement of supplies, services, and construction, regardless of what these agreements may be called.
CONSULTANT – A firm providing professional services for the city.

2.02 SPECIAL CONDITIONS: Any and all Special Conditions contained in this ITB that may be in variance or conflict with these General Conditions shall have precedence over these General Conditions. If no changes or deletions to General Conditions are made in the Special Conditions, then the General Conditions shall prevail in their entirety,

PART III BIDDING AND AWARD PROCEDURES:

3.01 SUBMISSION AND RECEIPT OF BIDS: To receive consideration, bids must be received prior to the bid opening date and time. Unless otherwise specified, Bidders should use the proposal forms provided by the City. These forms may be duplicated, but failure to use the forms may cause the bid to be rejected. Any erasures or corrections on the bid must be made in ink and initialed by Bidder in ink. All information submitted by the Bidder shall be printed, typewritten or filled in with pen and ink. Bids shall be signed in ink. Separate bids must be submitted for each ITB issued by the City in separate sealed envelopes properly marked. When a particular ITB or RFP requires multiple copies of bids or proposals they may be included in a single envelope or package properly sealed and identified. Only send bids via facsimile transmission (FAX) if the ITB specifically states that bids sent via FAX will be considered. If such a statement is not included in the ITB, bids sent via FAX will be rejected. Bids will be publicly opened in the Procurement Office, or other designated area, in the presence of Bidders, the public, and City staff. Bidders and the public are invited and encouraged to attend bid

openings. Bids will be tabulated and made available for review by Bidder's and the public in accordance with applicable regulations.

3.02 MODEL NUMBER CORRECTIONS: If the model number for the make specified in this ITB is incorrect, or no longer available and replaced with an updated model with new specifications, the Bidder shall enter the correct model number on the bidder proposal page. In the case of an updated model with new specifications, Bidder shall provide adequate information to allow the City to determine if the model bid meets the City's requirements.

3.03 PRICES QUOTED: Deduct trade discounts, and quote firm net prices. Give both unit price and extended total. In the case of a discrepancy in computing the amount of the bid, the unit price quoted will govern. All prices quoted shall be F.O.B. destination, freight prepaid (Bidder pays and bears freight charges, Bidder owns goods in transit and files any claims), unless otherwise stated in Special Conditions. Each item must be bid separately. No attempt shall be made to tie any item or items contained in the ITB with any other business with the City.

3.04 TAXES: The City of Fort Lauderdale is exempt from Federal Excise and Florida Sales taxes on direct purchase of tangible property. Exemption **number for EIN is 59-6000319, and State Sales tax exemption number is 85-8013875578C-1.**

3.05 WARRANTIES OF USAGE: Any quantities listed in this ITB as estimated or projected are provided for tabulation and information purposes only. No warranty or guarantee of quantities is given or implied. It is understood that the Contractor will furnish the City's needs as they arise.

3.06 APPROVED EQUAL: When the technical specifications call for a brand name, manufacturer, make, model, or vendor catalog number with acceptance of APPROVED EQUAL, it shall be for the purpose of establishing a level of quality and features desired and acceptable to the City. In such cases, the City will be receptive to any unit that would be considered by qualified City personnel as an approved equal. In that the specified make and model represent a level of quality and features desired by the City, the Bidder must state clearly in the bid any variance from those specifications. It is the Bidder's responsibility to provide adequate information, in the bid, to enable the City to ensure that the bid meets the required criteria. If adequate information is not submitted with the bid, it may be rejected. The City will be the sole judge in determining if the item bid qualifies as an approved equal.

3.07 MINIMUM AND MANDATORY TECHNICAL SPECIFICATIONS: The technical specifications may include items that are considered minimum, mandatory, or required. If any Bidder is unable to meet or exceed these items, and feels that the technical specifications are overly restrictive, the bidder must notify the Procurement Services Division immediately. Such notification must be received by the Procurement Services Division prior to the deadline contained in the ITB, for questions of a material nature, or prior to five (5) days before bid due and open date, whichever occurs first. If no such notification is received prior to that deadline, the City will consider the technical specifications to be acceptable to all bidders.

3.08 MISTAKES: Bidders are cautioned to examine all terms, conditions, specifications, drawings, exhibits, addenda, delivery instructions and special conditions pertaining to the ITB. Failure of the Bidder to examine all pertinent documents shall not entitle the bidder to any relief from the conditions imposed in the contract.

3.09 SAMPLES AND DEMONSTRATIONS: Samples or inspection of product may be requested to determine suitability. Unless otherwise specified in Special Conditions, samples shall be requested after the date of bid opening, and if requested should be received by the City within seven (7) working days of request. Samples, when requested, must be furnished free of expense to the City and if not used in testing or destroyed, will upon request of the Bidder, be returned within thirty (30) days of bid award at Bidder's expense. When required, the City may request full demonstrations of units prior to award. When such demonstrations are requested, the Bidder shall respond promptly and arrange a demonstration at a convenient location. Failure to provide samples or demonstrations as specified by the City may result in rejection of a bid.

3.10 LIFE CYCLE COSTING: If so specified in the ITB, the City may elect to evaluate equipment proposed on the basis of total cost of ownership. In using Life Cycle Costing, factors such as the following may be considered: estimated useful life, maintenance costs, cost of supplies, labor intensity, energy usage, environmental impact, and residual value. The City reserves the right to use those or other applicable criteria, in its sole opinion that will most accurately estimate total cost of use and ownership.

3.11 BIDDING ITEMS WITH RECYCLED CONTENT: In addressing environmental concerns, the City of Fort Lauderdale encourages Bidders to submit bids or alternate bids containing items with recycled content. When submitting bids containing items with recycled content, Bidder shall provide documentation adequate for the City to verify the recycled content. The City prefers packaging consisting of materials that are degradable or able to be recycled. When specifically stated in the ITB, the City may give preference to bids containing items

manufactured with recycled material or packaging that is able to be recycled.

3.12 USE OF OTHER GOVERNMENTAL CONTRACTS: The City reserves the right to reject any part or all of any bids received and utilize other available governmental contracts, if such action is in its best interest.

3.13 QUALIFICATIONS/INSPECTION: Bids will only be considered from firms normally engaged in providing the types of commodities/services specified herein. The City reserves the right to inspect the Bidder's facilities, equipment, personnel, and organization at any time, or to take any other action necessary to determine Bidder's ability to perform. The Procurement Director reserves the right to reject bids where evidence or evaluation is determined to indicate inability to perform.

3.14 BID SURETY: If Special Conditions require a bid security, it shall be submitted in the amount stated. A bid security can be in the form of a bid bond or cashier's check. Bid security will be returned to the unsuccessful bidders as soon as practicable after opening of bids. Bid security will be returned to the successful bidder after acceptance of the performance bond, if required; acceptance of insurance coverage, if required; and full execution of contract documents, if required; or conditions as stated in Special Conditions.

3.15 PUBLIC RECORDS/TRADE SECRETS/COPYRIGHT: The Proposer's response to the RFP is a public record pursuant to Florida law, which is subject to disclosure by the City under the State of Florida Public Records Law, Florida Statutes Chapter 119.07 ("Public Records Law"). The City shall permit public access to all documents, papers, letters or other material submitted in connection with this RFP and the Contract to be executed for this RFP, subject to the provisions of Chapter 119.07 of the Florida Statutes.

Any language contained in the Proposer's response to the RFP purporting to require confidentiality of any portion of the Proposer's response to the RFP, except to the extent that certain information is in the City's opinion a Trade Secret pursuant to Florida law, shall be void. If a Proposer submits any documents or other information to the City which the Proposer claims is Trade Secret information and exempt from Florida Statutes Chapter 119.07 ("Public Records Laws"), the Proposer shall clearly designate that it is a Trade Secret and that it is asserting that the document or information is exempt. The Proposer must specifically identify the exemption being claimed under Florida Statutes 119.07. The City shall be the final arbiter of whether any information contained in the Proposer's response to the RFP constitutes a Trade Secret. The city's determination of whether an exemption applies shall be final, and the proposer agrees to defend, indemnify, and hold harmless the city and the city's officers, employees, and agent, against any loss or damages incurred by any person or entity as a result of the city's treatment of records as public records. Proposals purporting to be subject to copyright protection in full or in part will be rejected.

EXCEPT FOR CLEARLY MARKED PORTIONS THAT ARE BONA FIDE TRADE SECRETS PURSUANT TO FLORIDA LAW, DO NOT MARK YOUR RESPONSE TO THE RFP AS PROPRIETARY OR CONFIDENTIAL. DO NOT MARK YOUR RESPONSE TO THE RFP OR ANY PART THEREOF AS COPYRIGHTED.

3.16 PROHIBITION OF INTEREST: No contract will be awarded to a bidding firm who has City elected officials, officers or employees affiliated with it, unless the bidding firm has fully complied with current Florida State Statutes and City Ordinances relating to this issue. Bidders must disclose any such affiliation. Failure to disclose any such affiliation will result in disqualification of the Bidder and removal of the Bidder from the City's bidder lists and prohibition from engaging in any business with the City.

3.17 RESERVATIONS FOR AWARD AND REJECTION OF BIDS: The City reserves the right to accept or reject any or all bids, part of bids, and to waive minor irregularities or variations to specifications contained in bids, and minor irregularities in the bidding process. The City also reserves the right to award the contract on a split order basis, lump sum basis, individual item basis, or such combination as shall best serve the interest of the City. The City reserves the right to make an award to the responsive and responsible bidder whose product or service meets the terms, conditions, and specifications of the ITB and whose bid is considered to best serve the City's interest. In determining the responsiveness of the offer and the responsibility of the Bidder, the following shall be considered <u>when applicable</u>: the ability, capacity and skill of the Bidder to perform as required; whether the Bidder can perform promptly, or within the time specified, without delay or interference; the character, integrity, reputation, judgment, experience and efficiency of the Bidder; the quality of past performance by the Bidder; the previous and existing compliance by the Bidder with related laws and ordinances; the sufficiency of the Bidder's financial resources; the availability, quality and adaptability of the Bidder's supplies or services to the required use; the ability of the Bidder to provide future maintenance, service or parts; the number and scope of conditions attached to the bid.

If the ITB provides for a contract trial period, the City reserves the right, in the event the selected bidder does not perform satisfactorily, to award a trial period to the next ranked bidder or to award a contract to the next ranked bidder, if that bidder has successfully provided services to the City in the past. This procedure to

continue until a bidder is selected or the contract is re-bid, at the sole option of the City.

3.18 LEGAL REQUIREMENTS: Applicable provisions of all federal, state, county laws, and local ordinances, rules and regulations, shall govern development, submittal and evaluation of all bids received in response hereto and shall govern any and all claims and disputes which may arise between person(s) submitting a bid response hereto and the City by and through its officers, employees and authorized representatives, or any other person, natural or otherwise; and lack of knowledge by any bidder shall not constitute a cognizable defense against the legal effect thereof.

3.19 BID PROTEST PROCEDURE: ANY PROPOSER OR BIDDER WHO IS NOT RECOMMENDED FOR AWARD OF A CONTRACT AND WHO ALLEGES A FAILURE BY THE CITY TO FOLLOW THE CITY'S PROCUREMENT ORDINANCE OR ANY APPLICABLE LAW MAY PROTEST TO THE CHIEF PROCUREMENT OFFICER, BY DELIVERING A LETTER OF PROTEST TO THE DIRECTOR OF FINANCE WITHIN FIVE (5) DAYS AFTER A NOTICE OF INTENT TO AWARD IS POSTED ON THE CITY'S WEB SITE AT THE FOLLOWING LINK:
https://www.fortlauderdale.gov/departments/finance/procurement-services/notices-of-intent-to-award
THE COMPLETE PROTEST ORDINANCE MAY BE FOUND ON THE CITY'S WEB SITE AT THE FOLLOWING LINK: https://library.municode.com/fl/fort_lauderdale/codes/code_of_ordinances?nodeId=COOR_CH2AD_ARTVFI_DIV2PR_S2-182DIREPR

PART IV BONDS AND INSURANCE

4.01 PERFORMANCE BOND: If a performance bond is required in Special Conditions, the Contractor shall within fifteen (15) working days after notification of award, furnish to the City a Performance Bond, payable to the City of Fort Lauderdale, Florida, in the face amount specified in Special Conditions as surety for faithful performance under the terms and conditions of the contract. If the bond is on an annual coverage basis, renewal for each succeeding year shall be submitted to the City thirty (30) days prior to the termination date of the existing Performance Bond. The Performance Bond must be executed by a surety company of recognized standing, authorized to do business in the State of Florida and having a resident agent.

Acknowledgement and agreement is given by both parties that the amount herein set for the Performance Bond is not intended to be nor shall be deemed to be in the nature of liquidated damages nor is it intended to limit the liability of the Contractor to the City in the event of a material breach of this Agreement by the Contractor.

4.02 INSURANCE: If the Contractor is required to go on to City property to perform work or services as a result of ITB award, the Contractor shall assume full responsibility and expense to obtain all necessary insurance as required by City or specified in Special Conditions.

The Contractor shall provide to the Procurement Services Division original certificates of coverage and receive notification of approval of those certificates by the City's Risk Manager prior to engaging in any activities under this contract. The Contractors insurance is subject to the approval of the City's Risk Manager. The certificates must list the City as an ADDITIONAL INSURED for General Liability Insurance, and shall have no less than thirty (30) days written notice of cancellation or material change. Further modification of the insurance requirements may be made at the sole discretion of the City's Risk Manager if circumstances change or adequate protection of the City is not presented. Bidder, by submitting the bid, agrees to abide by such modifications.

PART V PURCHASE ORDER AND CONTRACT TERMS:

5.01 COMPLIANCE TO SPECIFICATIONS, LATE DELIVERIES/PENALTIES: Items offered may be tested for compliance to bid specifications. Items delivered which do not conform to bid specifications may be rejected and returned at Contractor's expense. Any violation resulting in contract termination for cause or delivery of items not conforming to specifications, or late delivery may also result in:

- Bidders name being removed from the City's bidder's mailing list for a specified period and Bidder will not be recommended for any award during that period.
- All City Departments being advised to refrain from doing business with the Bidder.
- All other remedies in law or equity.

5.02 ACCEPTANCE, CONDITION, AND PACKAGING: The material delivered in response to ITB award shall remain the property of the Seller until a physical inspection is made and the material accepted to the satisfaction of the City. The material must comply fully with the terms of the ITB, be of the required quality, new, and the latest model. All containers shall be suitable for storage and shipment by common carrier, and all prices shall include standard commercial packaging. The City will not accept substitutes of any kind. Any substitutes or material not meeting specifications will be returned at the Bidder's expense. Payment will be made only after City receipt and acceptance of materials or services.

5.03 SAFETY STANDARDS: All manufactured items and fabricated assemblies shall comply with applicable requirements of the Occupation Safety and Health Act of 1970 as amended, and be in compliance with Chapter 442, Florida Statutes. Any toxic substance listed in Section 38F-41.03 of the Florida Administrative Code delivered as a result of this order must be accompanied by a completed Safety Data Sheet (SDS).

5.04 ASBESTOS STATEMENT: All material supplied must be 100% asbestos free. Bidder, by virtue of bidding, certifies that if awarded any portion of the ITB the bidder will supply only material or equipment that is 100% asbestos free.

5.05 OTHER GOVERNMENTAL ENTITIES: If the Bidder is awarded a contract as a result of this ITB, the bidder may, if the bidder has sufficient capacity or quantities available, provide to other governmental agencies, so requesting, the products or services awarded in accordance with the terms and conditions of the ITB and resulting contract. Prices shall be F.O.B. delivered to the requesting agency.

5.06 VERBAL INSTRUCTIONS PROCEDURE: No negotiations, decisions, or actions shall be initiated or executed by the Contractor as a result of any discussions with any City employee. Only those communications which are in writing from an authorized City representative may be considered. Only written communications from Contractors, which are assigned by a person designated as authorized to bind the Contractor, will be recognized by the City as duly authorized expressions on behalf of Contractors.

5.07 INDEPENDENT CONTRACTOR: The Contractor is an independent contractor under this Agreement. Personal services provided by the Proposer shall be by employees of the Contractor and subject to supervision by the Contractor, and not as officers, employees, or agents of the City. Personnel policies, tax responsibilities, social security, health insurance, employee benefits, procurement policies unless otherwise stated in this ITB, and other similar administrative procedures applicable to services rendered under this contract shall be those of the Contractor.

5.08 INDEMNITY/HOLD HARMLESS AGREEMENT: The Contractor agrees to protect, defend, indemnify, and hold harmless the City of Fort Lauderdale and its officers, employees and agents from and against any and all losses, penalties, damages, settlements, claims, costs, charges for other expenses, or liabilities of every and any kind including attorney's fees, in connection with or arising directly or indirectly out of the work agreed to or performed by Contractor under the terms of any agreement that may arise due to the bidding process. Without limiting the foregoing, any and all such claims, suits, or other actions relating to personal injury, death, damage to property, defects in materials or workmanship, actual or alleged violations of any applicable Statute, ordinance, administrative order, rule or regulation, or decree of any court shall be included in the indemnity hereunder.

5.09 TERMINATION FOR CAUSE: If, through any cause, the Contractor shall fail to fulfill in a timely and proper manner its obligations under this Agreement, or if the Contractor shall violate any of the provisions of this Agreement, the City may upon written notice to the Contractor terminate the right of the Contractor to proceed under this Agreement, or with such part or parts of the Agreement as to which there has been default, and may hold the Contractor liable for any damages caused to the City by reason of such default and termination. In the event of such termination, any completed services performed by the Contractor under this Agreement shall, at the option of the City, become the City's property and the Contractor shall be entitled to receive equitable

compensation for any work completed to the satisfaction of the City. The Contractor, however, shall not be relieved of liability to the City for damages sustained by the City by reason of any breach of the Agreement by the Contractor, and the City may withhold any payments to the Contractor for the purpose of setoff until such time as the amount of damages due to the City from the Contractor can be determined.

5.10 TERMINATION FOR CONVENIENCE: The City reserves the right, in its best interest as determined by the City, to cancel contract by giving written notice to the Contractor thirty (30) days prior to the effective date of such cancellation.

5.11 CANCELLATION FOR UNAPPROPRIATED FUNDS: The obligation of the City for payment to a Contractor is limited to the availability of funds appropriated in a current fiscal period, and continuation of the contract into a subsequent fiscal period is subject to appropriation of funds, unless otherwise authorized by law.

5.12 RECORDS/AUDIT: The Contractor shall maintain during the term of the contract all books of account, reports and records in accordance with generally accepted accounting practices and standards for records directly related to this contract. The Contractor agrees to make available to the City Auditor or designee, during normal business hours and in Broward, Miami-Dade or Palm Beach Counties, all books of account, reports and records relating to this contract should be retained for the duration of the contract and for three years after the final payment under this Agreement, or until all pending audits, investigations or litigation matters relating to the contract are closed, whichever is later.

5.13 PERMITS, TAXES, LICENSES: The successful Contractor shall, at their own expense, obtain all necessary permits, pay all licenses, fees and taxes, required to comply with all local ordinances, state and federal laws, rules and regulations applicable to business to be carried out under this contract.

5.14 LAWS/ORDINANCES: The Contractor shall observe and comply with all Federal, state, local and municipal laws, ordinances rules and regulations that would apply to this contract.

5.15 **NON-DISCRIMINATION:** There shall be no discrimination as to race, sex, color, creed, age or national origin in the operations conducted under this contract. The following applies to contracts with values over $100,000: The Contractor certifies and represents that it will comply with Section 2-187, Code of Ordinances of the City of Fort Lauderdale, Florida, ("Section 2-187"), by not discriminating against the Contractor's employees based on the employee's race, color, religion, gender (including identity or expression), marital status, sexual orientation, national origin, age, disability or any other protected classification as defined by applicable law, during the entire term of the contract that arises out of this ITB. The failure of the Contractor to comply with Section 2-187 shall be deemed to be a material breach of the contract, entitling the City to pursue any of the following remedies or any remedy provided under applicable law: (a) The City may terminate the contract if the Contractor fails to comply with Section 2-187; and (b) The City may retain all monies due or to become due until the Contractor complies with Section 2-187; and (c) The Contractor may be subject to debarment or suspension proceedings consistent with the procedures in Section 2-183, Code of Ordinances of the City of Fort Lauderdale, Florida.

5.16 UNUSUAL CIRCUMSTANCES: If during a contract term where costs to the City are to remain firm or adjustments are restricted by a percentage or CPI cap, unusual circumstances that could not have been foreseen by either party of the contract occur, and those circumstances significantly affect the Contractor's cost in providing the required prior items or services, then the Contractor may request adjustments to the costs to the City to reflect the changed circumstances. The circumstances must be beyond the control of the Contractor, and the requested adjustments must be fully documented. The City may, after examination, refuse to accept the adjusted costs if they are not properly documented, increases are considered to be excessive, or decreases are considered to be insufficient. In the event the City does not wish to accept the adjusted costs and the matter cannot be resolved to the satisfaction of the City, the City will reserve the following options:

1. The contract can be canceled by the City upon giving thirty (30) days written notice to the Contractor with no penalty to the City or Contractor. The Contractor shall fill all City requirements submitted to the Contractor until the termination date contained in the notice.

2. The City requires the Contractor to continue to provide the items and services at the firm fixed (non-adjusted) cost until the termination of the contract term then in effect.

3. If the City, in its interest and in its sole opinion, determines that the Contractor in a capricious manner attempted to use this section of the contract to relieve them of a legitimate obligation under the contract, and no unusual circumstances had occurred, the City reserves the right to take any and all action under law or equity. Such action shall include, but not be limited to, declaring the Contractor in default and disqualifying him for receiving any business from the City for a stated period of time.

If the City does agree to adjusted costs, these adjusted costs shall not be invoiced to the City until the Contractor receives notice in writing signed by a person authorized to bind the City in such matters.

5.17 **ELIGIBILITY:** If applicable, the Contractor must first register with the Department of State of the State of Florida, in accordance with Florida State Statutes, prior to entering into a contract with the City.

5.18 **PATENTS AND ROYALTIES:** The Contractor, without exception, shall indemnify and save harmless the City and its employees from liability of any nature and kind, including cost and expenses for or on account of any copyrighted, patented or un-patented invention, process, or article manufactured or used in the performance of the contract, including its use by the City. If the Contractor uses any design, device, or materials covered by letters, patent or copyright, it is mutually agreed and understood without exception that the bid prices shall include all royalties or costs arising from the use of such design, device, or materials in any way involved in the work.

5.19 **ASSIGNMENT:** Contractor shall not transfer or assign the performance required by this ITB without the prior written consent of the City. Any award issued pursuant to this ITB, and the monies, which may become due hereunder, are not assignable except with the prior written approval of the City Commission or the City Manager or City Manager's designee, depending on original award approval.

5.20 **LITIGATION VENUE:** The parties waive the privilege of venue and agree that all litigation between them in the state courts shall take place in Broward County, Florida and that all litigation between them in the federal courts shall take place in the Southern District in and for the State of Florida.

5.21 **LOCATION OF UNDERGROUND FACILITIES:** If the Contractor, for the purpose of responding to this solicitation, requests the location of underground facilities through the Sunshine State One-Call of Florida, Inc. notification system or through any person or entity providing a facility locating service, and underground facilities are marked with paint, stakes or other markings within the City pursuant to such a request, then the Contractor, shall be deemed non-responsive to this solicitation in accordance with Section 2-184(5) of the City of Fort Lauderdale Code of Ordinances.

5.22 **PUBLIC RECORDS**

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT 954-828-5002, CITY CLERK'S OFFICE, 100 N. ANDREWS AVENUE, FORT LAUDERDALE, FLORIDA 33301, PRRCONTRACT@FORTLAUDERDALE.GOV.

Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service.

2. Upon request from the City's custodian of public records, provide the City with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes (2018), as may be amended or revised, or as otherwise provided by law.

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of this contract if the Contractor does not transfer the records to the City.

4. Upon completion of the Contract, transfer, at no cost, to the City all public records in possession of the Contractor or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of this Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of this Contract, the Contractor shall meet

all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.

BID NO. 12201-293 / PROJECT NO. 12089 SPECIFIC REFERENCES FORM

The contractor shall have at least five (5) years previous construction experience in constructing additions/modifications to existing public buildings in the State of Florida. Bidder shall submit proof of construction experience for a minimum of three (3) projects of similar scope and scale (or larger). **Bidder's are expected to provide information on each project by including these forms in their bid submittals**. If these forms are not utilized, the Bidder's must provide identical information to the City for evaluation purposes.

Note: Do not include proposed team members or parent/subsidiary companies as references in your submittals.

A. PRIME BIDDER'S NAME:

CLIENT NO.1 - Name of firm to be contacted:

Address:

Contact Person:

Phone No:

Contact E-Mail Address:

Project Performance Period: to

Dates should be in mm/yy format

Project Name :

Location of Project:

Overall Construction Cost:

Description of the overall scope:

Description of work that was self-performed by Bidder:

CLIENT NO.2 - Name of firm to be contacted:

Address:

Contact Person:

Phone No:

Contact E-Mail Address:

Project Performance Period: to

Dates should be in mm/yy format

Project Name :

Location of Project:

Overall Construction Cost:

Description of the overall scope:

Description of work that was self-performed by Bidder:

CLIENT NO.3 - Name of firm to be contacted:

Address:

Contact Person:

Phone No:

Contact E-Mail Address:

Project Performance Period: to

Dates should be in mm/yy format

Project Name :

Location of Project:

Overall Construction Cost:

Description of the overall scope:

Description of work that was self-performed by Bidder:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT

MINORITY BUSINESS ENTERPRISE (MBE) - WOMEN BUSINESS ENTERPRISE (WBE)

PRIME CONTRACTOR IDENTIFICATION FORM

In order to assist us in identifying the status of those companies doing business with the City of Fort Lauderdale, this form must be completed and returned with your bid package.

Name of Firm:

Address of Firm:

Telephone Number:

Name of Person Completing Form:

Title:

Signature:

Date:

City Project Number:

City Project Description:

Please check the item(s) which properly identify the status of your firm:

☐ Our firm is not a MBE or WBE.

☐ Our firm is a MBE, as at least 51 percent is owned and operated by one or more socially and economically disadvantaged individuals.

☐ American Indian ☐ Asian ☐ Black ☐ Hispanic

☐ Our firm is a WBE, as at least 51 percent is owned and operated by one or more women.

☐ American Indian ☐ Asian ☐ Black ☐ Hispanic

MBE/WBE CONTRACTOR INFORMATION

The City, in a continuing effort, is encouraging the increased participation of minority and women-owned businesses in Public Works Department related contracts. Along those lines, we are requiring that each firm provide documentation detailing their own programs for utilizing minority and women-owned businesses.

Submit this information as a part of this bid package and refer to the checklist, to ensure that all areas of concern are covered. The low responsive bidder may be contacted to schedule a meeting to discuss these objectives. It is our intention to proceed as quickly as possible with this project, so your cooperation in this matter is appreciated.

CONTRACTOR CHECKLIST

☐ List Previous City of Fort Lauderdale Contracts

☐ Number of Employees in your firm

--Percent (%) Women

--Percent (%) Minorities

--Job Classifications of Women and Minorities

☐ Use of minority and/or women subcontractors on past projects.

☐ Nature of the work subcontracted to minority and/or women-owned firms.

☐ How are subcontractors notified of available opportunities with your firm?

☐ Anticipated amount to be subcontracted on this project.

☐ Anticipated amount to be subcontracted to minority and/or women-owned businesses on this project.

QUESTIONNAIRE SHEET

PLEASE PRINT OR TYPE:

Firm Name:

President

Business Address:

Telephone:

Fax:

E-Mail Address:

What was the last project of this nature which you completed? Include the year, description, and contract value.

The following are named as three corporations and representatives of those corporations for which you have performed work similar to that required by this contract, and which the City may contact as your references (include addresses, telephone numbers and e-mail addresses). Include the project name, year, description, and contract value.

How many years has your organization been in business?

Have you ever failed to complete work awarded to you; if so, where and why?

The name of the qualifying agent for the firm and his position is:

Certificate of Competency Number of Qualifying Agent:

Effective Date: Expiration Date:

Licensed in: Engineering Contractor's License #

(County/State)

Expiration Date:

NOTE: To be considered for award of this contract, the bidder must submit a financial statement upon request.

NOTE: Contractor must have proper licensing and shall provide copy of same with his proposal.

QUESTIONNAIRE SHEET

1. Have you personally inspected the proposed work and have you a complete plan for its performance?

2. Will you sublet any part of this work? If so, list the portions or specialties of the work that you will.

a)

b)

c)

d)

e)

f)

g)

3. What equipment do you own that is available for the work?

4. What equipment will you purchase for the proposed work?

5. What equipment will you rent for the proposed work?

CONTRACTOR'S CERTIFICATE OF COMPLIANCE WITH NON-DISCRIMINATION PROVISIONS OF THE CONTRACT

The completed and signed form should be returned with the Contractor's submittal. If not provided with submittal, the Contractor must submit within three business days of City's request. Contractor may be deemed non-responsive for failure to fully comply within stated timeframes.

Pursuant to City Ordinance Sec. 2-17(a)(i)(ii), bidders must certify compliance with the Non-Discrimination provision of the ordinance.

(a) Contractors doing business with the City shall not discriminate against their employees based on the employee's race, color, religion, gender (including identity or expression), marital status, sexual orientation, national origin, age, disability or any other protected classification as defined by applicable law.

Contracts. Every Contract exceeding $100,000, or otherwise exempt from this section shall contain language that obligates the Contractor to comply with the applicable provisions of this section.

The Contract shall include provisions for the following:

(i) The Contractor certifies and represents that it will comply with this section during the entire term of the contract.

(ii) The failure of the Contractor to comply with this section shall be deemed to be a material breach of the contract, entitling the City to pursue any remedy stated below or any remedy provided under applicable law.

Authorized Signature

Print Name and Title

Date

CONTRACT PAYMENT METHOD

The City of Fort Lauderdale has implemented a Procurement Card (P-Card) program which changes how payments are remitted to its vendors. The City is transitioning from traditional paper checks to credit card payments via MasterCard or Visa as part of this program.

This allows you as a vendor of the City of Fort Lauderdale, to receive your payment fast and safely. No more waiting for checks to be printed and mailed.

In accordance with Article 7, item 7.6 of the contract, payments on this contract will be made utilizing the City's P-Card. Accordingly, bidders must presently have the ability to accept these credit cards or take whatever steps necessary to implement acceptance of a card before the start of the contract term, or contract award by the City.

Please indicate with which credit card you prefer to be paid:

☐ Master Card

☐ Visa Card

Company Name: _____

Signature: _____

Print Name Title: _____

CONSTRUCTION BID CERTIFICATION

Please Note: All fields below must be completed. If the field does not apply to you, please note N/A in that field. If you are a foreign corporation, you may be required to obtain a certificate of authority from the department of state, in accordance with Florida Statute §607.1501 (visit http://www.dos.state.fl.us/).

Company: (Legal Registration)

Address:

City: State: Zip:

Telephone No. FAX No. Email:

Does your firm qualify for MBE or WBE status: MBE ☐ WBE ☐

If a corporation, state the name of the President, Secretary and Resident Agent. If a partnership, state the names of all partners. If a trade name, state the names of the individuals who do business under the trade name.

Name	**Title**	**Name**	**Title**
Name	**Title**	**Name**	**Title**

ADDENDUM ACKNOWLEDGEMENT - Bidder acknowledges that the following addenda have been received and are included in the bid:

Addendum No.	Date Received	Addendum No.	Date Received	Addendum No.	Date Received	Addendum No.	Date Received

VARIANCES: If you take exception or have variances to any term, condition, specification, or requirement in this bid you must specify such variance in the space provided below or reference in the space provided below all variances contained on other pages within your bid. Additional pages may be attached if necessary. No variances will be deemed to be part of the bid submitted unless such is listed and contained in the space provided below. The City does not, by virtue of submitting a variance, necessarily accept any variances. If no statement is contained in the below space, it is hereby implied that your response is in full compliance with this competitive solicitation. If you do not have variances, simply mark N/A. If submitting your response electronically through BIDSYNC you must also click the "Take Exception" button.

The below signatory affirms that he has or will obtain all required permits and licenses from the appropriate agencies, and that his firm is authorized to do business in the State of Florida. The below signatory agrees to furnish all labor, tools, material, equipment and supplies, and to sustain all the expense incurred in doing the work set forth in strict accordance with the bid plans and contract documents at the unit prices indicated if awarded a contract. The below signatory has not divulged to, discussed, or compared this bid with other bidders, and has not colluded with any other bidder or parties to this bid whatsoever. Furthermore, the undersigned guarantees the truth and accuracy of all statements and answers contained in this bid. The below signatory also hereby agrees, by virtue of submitting or attempting to submit a bid, that in no event shall the City's liability for bidder's direct, indirect, incidental, consequential, special or exemplary damages, expenses, or lost profits arising out of this competitive solicitation process, including but not limited to public advertisement, bid conferences, site visits, evaluations, oral presentations, or award proceedings exceed the amount of Five Hundred Dollars ($500.00). This limitation shall not apply to claims arising under any provision of indemnification or the City's protest ordinance contained in this competitive solicitation.

Submitted by:

Name (printed) Signature

Date:

Title

City of Fort Lauderdale • Procurement Services Division
100 N. Andrews Avenue, 619 • Fort Lauderdale, Florida 33301
954-828-5933 Fax 954-828-5576
purchase@fortlauderdale.gov

ADDENDUM NO. 1

ITB No. 12201-293
TITLE: Coconut Isle Bridge Replacement (P12089)

ISSUED: 11/19/18

This addendum is being issued to make the following change(s):

1. Upload the following documents:
    a. Core Boring
    b. Topographic Survey

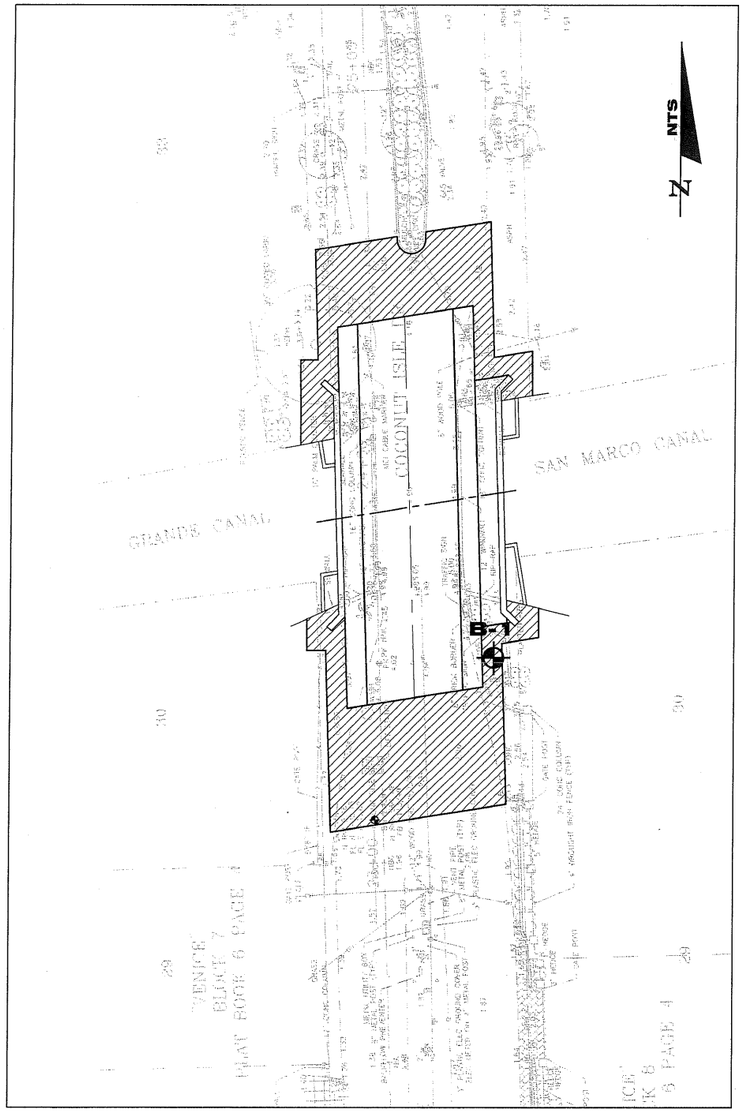
All other terms, conditions, and specifications remain unchanged.

Ginah Joseph
Procurement Specialist II

Company Name: _____
(please print)

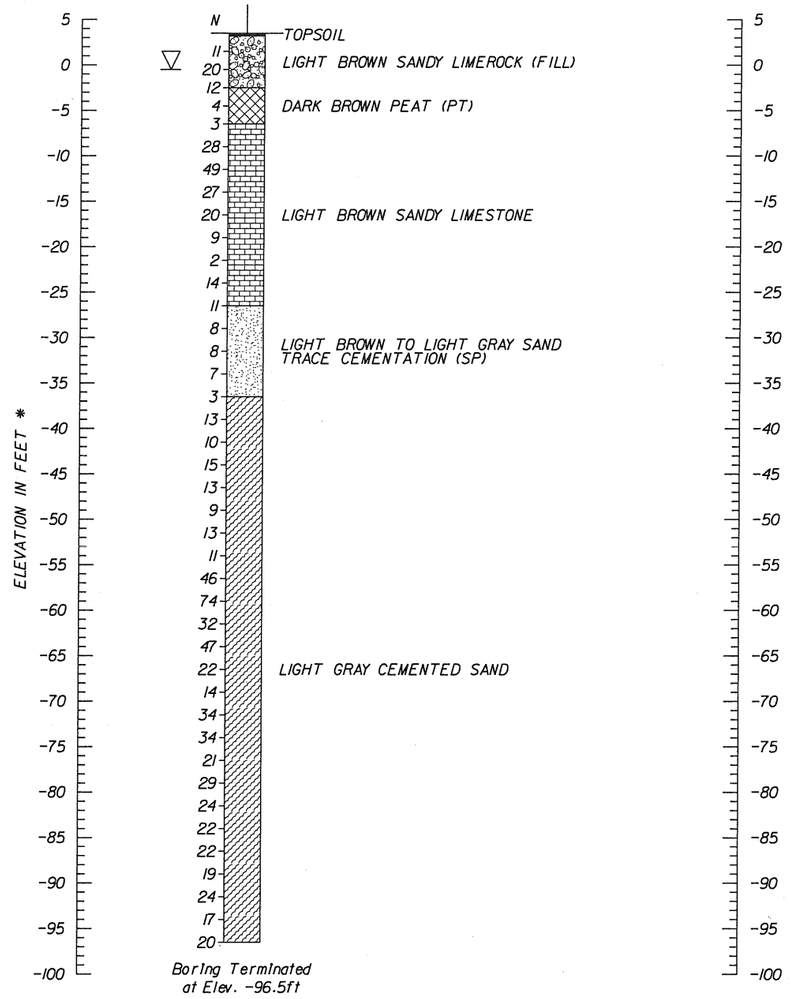
Bidder's Signature: _____

Date: _____



BOR # B-1
STA. 23+50.00 BL Survey*
OFF. 28.0' RT*
ELEV. 3.5*
DATE 8/11/2015
HAMMER Safety
RIG D-25
NORTHING 650034.621
EASTING 944370.205

Topsoil
Sandy Gravel
Peat
Limestone Hard
Sand
Coquina



NOTES:

▽ ENCOUNTERED WATER TABLE DURING DRILLING

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION. (UNLESS OTHERWISE NOTED.)

MC=	NATURAL MOISTURE CONTENT (%)
-200=	FINES PASSING #200 SIEVE (%)
OC=	ORGANIC CONTENT (%)
LL=	LIQUID LIMIT (%)
PI=	PLASTICITY INDEX (%)
NP=	INDICATES NON-PLASTIC
WOH=	WEIGHT OF HAMMER

STRATA BOUNDARIES ARE APPROXIMATE AND MAY VARY BETWEEN OR AWAY FROM BORING LOCATIONS.

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.375 Inches
SPOON OUTSIDE DIA.	2.0 Inches
AVG. HAMMER DROP	30.0 Inches
HAMMER WEIGHT	140.0 pounds

SPT CONSISTENCY CHART

SILTS AND CLAYS

CONSISTENCY	SAFETY HAMMER SPT N-VALUE (BLOW/FOOT)	AUTOMATIC HAMMER SPT N-VALUE (BLOW/FOOT)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 - 4	1 - 3
FIRM	4 - 8	3 - 6
STIFF	8 - 15	6 - 12
VERY STIFF	15 - 30	12 - 24
HARD	GREATER THAN 30	GREATER THAN 24

SPT DENSITY CHART

GRANULAR MATERIALS

RELATIVE DENSITY	SAFETY HAMMER SPT N-VALUE (BLOW/FOOT)	AUTOMATIC HAMMER SPT N-VALUE (BLOW/FOOT)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 - 10	3 - 8
MEDIUM	10 - 30	8 - 24
DENSE	30 - 50	24 - 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

RAJ KRISHNASAMY, P.E.
P.E. LICENSE NUMBER 53567
TIERRA SOUTH FLORIDA
2765 VISTA PARKWAY, S-10
WEST PALM BEACH, FL 33411
CERTIFICATE OF AUTHORIZATION 28073

DRAWN BY: JO 11-15
CHECKED BY: MP 11-15
DESIGNED BY: KV 11-15
CHECKED BY: RK 11-15

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
	BROWARD	

SHEET TITLE: REPORT OF CORE BORINGS

REF. DWG. NO.

PROJECT NAME: COCONUT ISLES BRIDGE

SHEET NO.

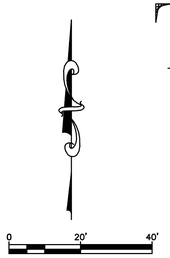
CAM 19-0085

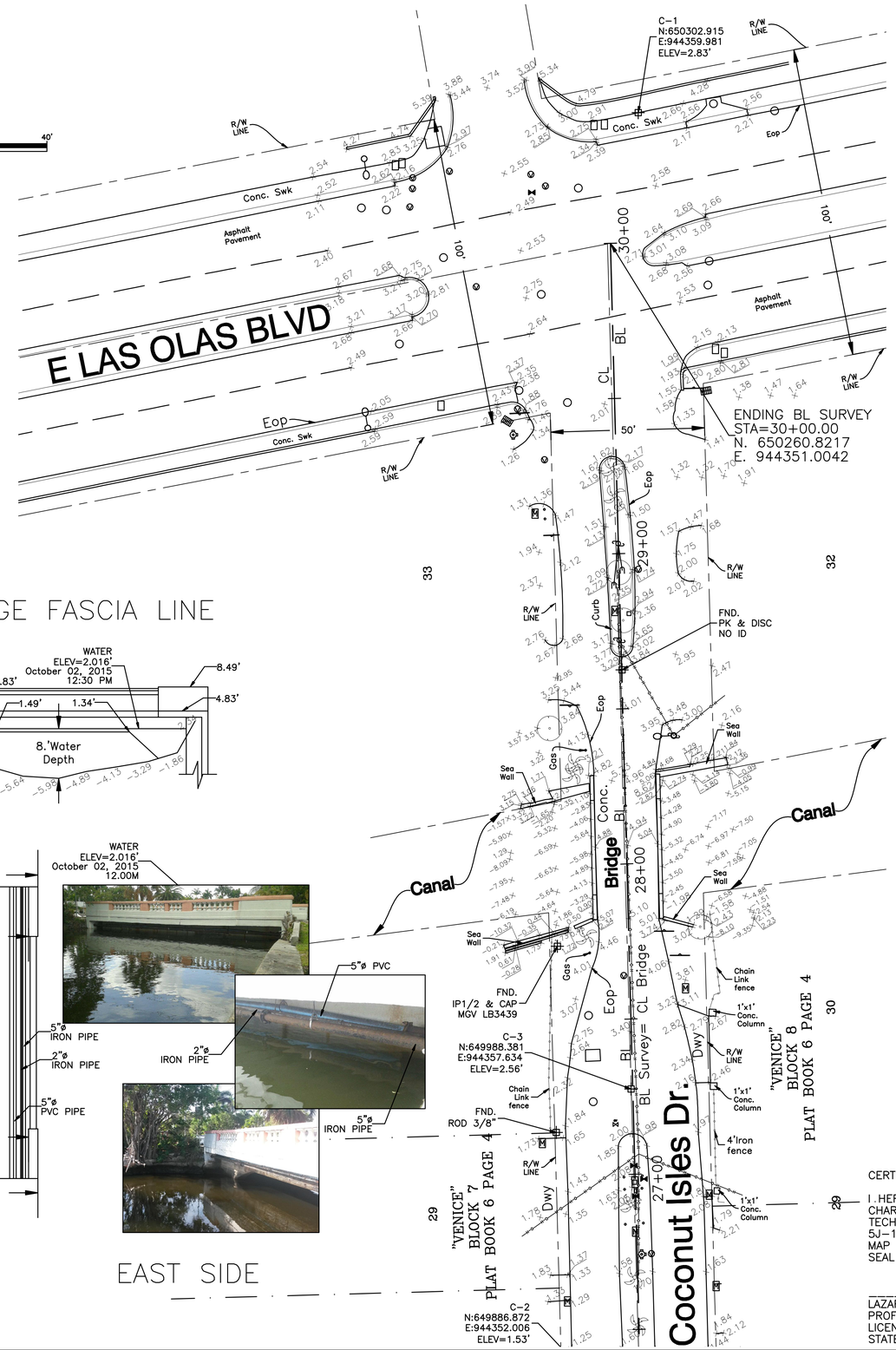
Exhibit 2

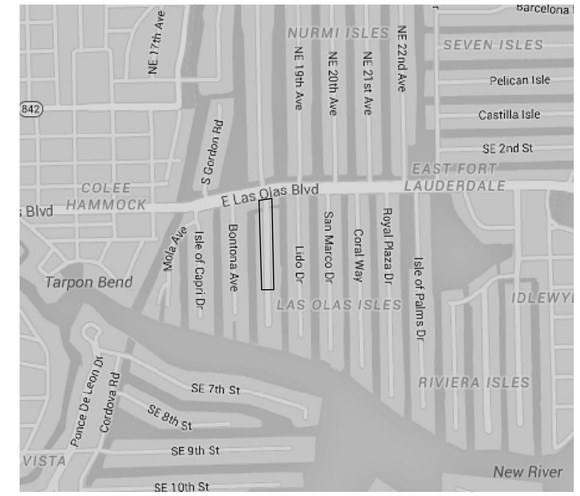
TOPOGRAPHIC SURVEY

LEGENDS & SIMBOLOGY

	SET OR FND
	ELECTRIC BOX
	STREET LIGHT POLE
	SEWER VALVE
	POWER POLE
	ELECTRIC METER
	WATER VALVE
	GUARD POST
	WATER METER
	MANHOLE
	WIRE PULL BOX
	GAY ANCHOR
	CATCH BASIN
	STREET SIGN
	PALM
	TREE
ELE	ELEVATION
NTS	NOT TO SCALE
DWY	DRIVE WAY
SWK	SIDEWALK
BL	BASE LINE
CONC.	CONCRETE
CL	CENTER LINE
R/W	RIGHT OF WAY
FND	FOUND
EOP	EDGE OF PAVEMENT
	OVERHEAD LINE
	FENCE LINE

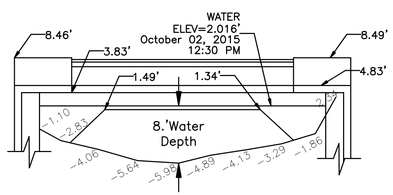




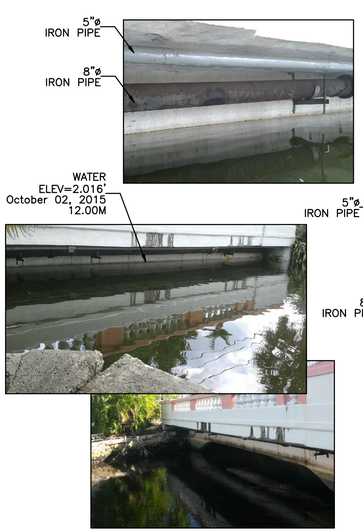


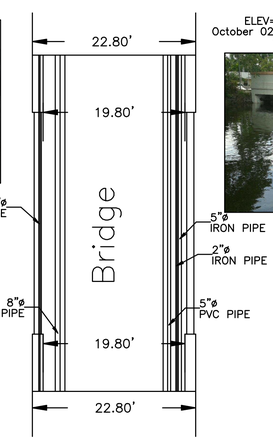
LOCATION MAP
NTS

BRIDGE FASCIA LINE



WEST SIDE





EAST SIDE

GENERAL NOTES:

1) THE LANDS SHOWN HEREON WERE NOT ABSTRACTED FOR EASEMENT OR OTHER RECORDED ENCUMBRANCES NOT SHOWN ON THE PLAT.
2) UNDERGROUND PORTIONS OF FOOTINGS, FOUNDATIONS OR OTHER IMPROVEMENTS WERE NOT LOCATED.
3) ONLY VISIBLE AND ABOVE GROUND OF APPARENT USE OF FEATURES WERE LOCATED.
4) FENCE OWNERSHIP NOT DETERMINED.
5) NO IDENTIFICATION FOUND ON PROPERTY CORNERS UNLESS NOTED
6) MEAN HIGH WATER (MHW): 0.33 FT
7) ACCURACY VERIFIED BY STATIC GPS IS 1: 50,000
8) BEARINGS AND COORDINATES ARE RELATIVE FLORIDA STATE PLANE COORDINATES SYSTEM, DATUM NAD83/90 PROJECTION TRANSVERSE MERCATOR (FLORIDA EAST ZONE) WITH A BEARING OF N16°13'32"E HAS BEEN ESTABLISH BETWEEN MONUMENTS DBLC1 STAMPED A1A-86-DBLC1 AND DBLC2 STAMPED A1A-86-DBLC2
9) VERTICAL CONTROL ARE BASED ON A LEVEL LOOP TO A SECOND BENCHMARK OF PROJECT SURVEY CONTROL SHEET & MEET MTS CLOSURE OF ± 0.05 FEET THE SQUARE ROOTS OF THE DISTANCE IN MILES.
10) ELEVATION SHOWN ARE BASED UPON N.G.V.D. 88 UNLEES OTHERWISE NOTED.
11) ACCURATE AND COMPLETE DEPICTION OF THE RESULTS OF A FIELD SURVEY PERFORMED UNDER MY DIRECTION AND COMPLETED ON 10/08/15
12) ADDITION OR DELETION TO SURVEY MAPS BY OTHER THAN THE SIGNING PARTY IS PROHIBITED WITHOUT WRITHEN CONSENT OF THE SIGNING PARTY.
13) COORDINATE ON THE TOPOGRAPHY SURVEY WERE DERIVED FROM GLOBAL POSITIONING SYSTEMS, USING STATIC METHOD AND A LOOPS TRAVERSE THAT MEET MTS CLOSURES, THE TRAVERSE CLOSURE ACHIEVE OVER A COMMERCIAL/ HIGH RIST LINEAR:1 FOOT IN 10,000 FEET.

14) FIELD BOOK MEI 090

CERTIFICATION:

I HEREBY CERTIFY THAT THIS BOUNDARY AND TOPOGRAPHIC SURVEY WAS MADE UNDER MY RESPONSIBLE CHARGE AND TO THE BEST OF MY KNOWLEDGE AND BELIEF IS TRUE, CORRECT AND MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE BOARD OF PROFESSIONAL LAND SURVEYORS IN CHAPTER 5J-17-050 FLORIDA ADMINISTRATIVE CODE PURSUANT TO SECTION 472.027, FLORIDA STATUTES. SURVEY MAP OR THE COPIES THEREOF ARE NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

_____

LAZARO FLEITAS, P.S.M.
PROFESSIONAL SURVEYOR AND MAPPER
LICENSE NO. 6518
STATE OF FLORIDA

ENGINEER: #Name
REG. No: #NO.
DATE: #DATE
TEL: #Tel
FAX: #Fax

DRAWN BY: E AZCONA
DATE: 10/09/15
DESIGNED BY:
SCALE: 1"=20'
CHECKED BY:
FIELD BOOK: MEI 090

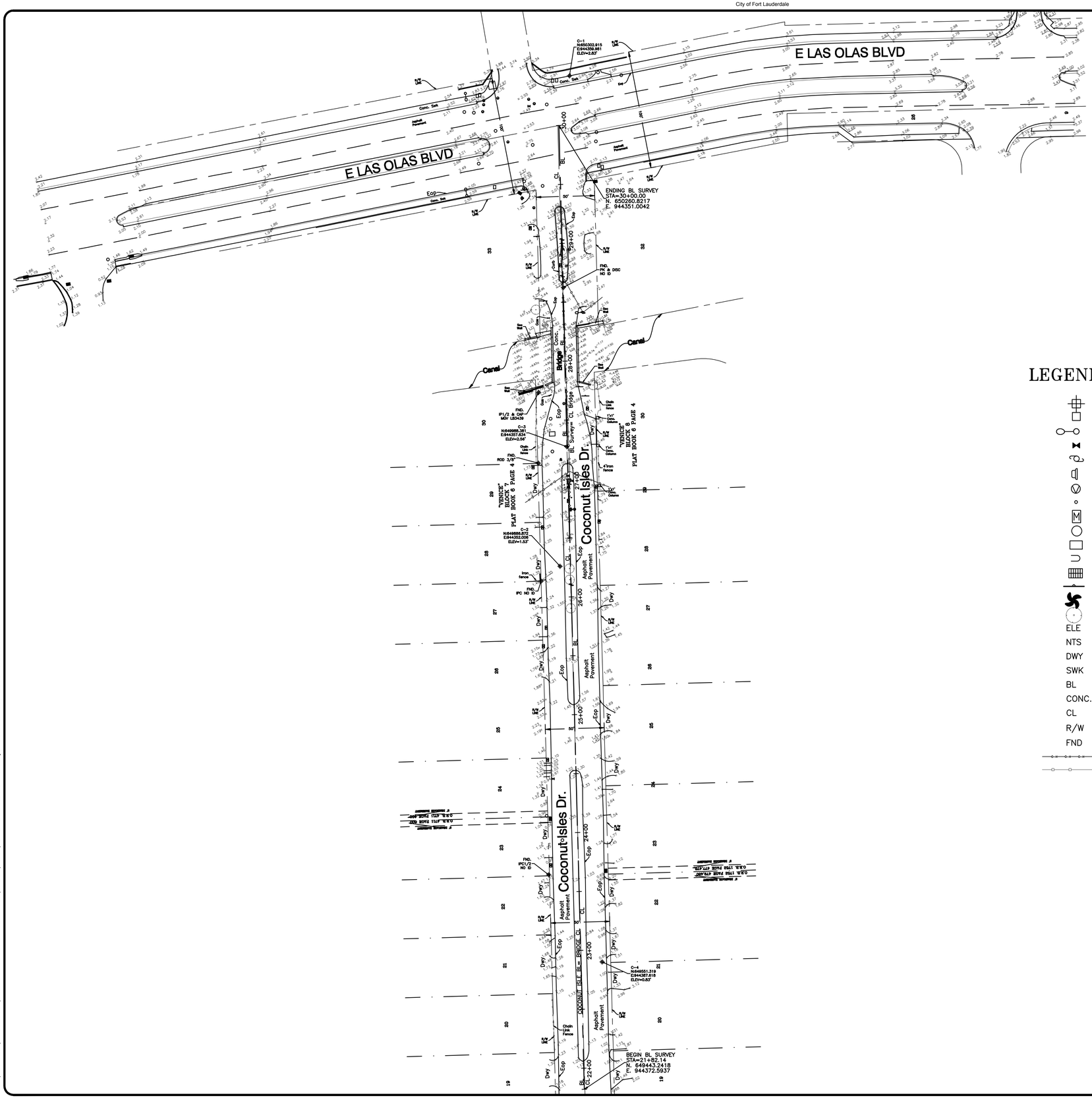
CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS			
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 20150029.000
COCONUT ISLE
TOPOGRAPHIC SURVEY
TOPO BRIDGE-DETAIL
COCONUT ISLE/SE 18th ST.

SHEET NO. 1 OF 2
TOTAL: 0
CAD FILE: TOPO COCO
DRAWING FILE NO. 152900-001-DETL

L:\SURVEY\PROJECTS\152900 COCONUT ISLE DR\CADD\DWG\TOPO COCO.DWG



LEGENDS & SIMBOLOGY

	SET OR FND
	ELECTRIC BOX
	STREET LIGHT POLE
	SEWER VALVE
	POWER POLE
	ELECTRIC METER
	WATER VALVE
	GUARD POST
	WATER METER
	MANHOLE
	WIRE PULL BOX
	GAY ANCHOR
	CATCH BASIN
	STREET SIGN
	PALM
	TREE
ELE	ELEVATION
NTS	NOT TO SCALE
DWY	DRIVE WAY
SWK	SIDEWALK
BL	BASE LINE
CONC.	CONCRETE
CL	CENTER LINE
R/W	RIGHT OF WAY
FND	FOUND
	OVERHEAD LINE
	FENCE LINE

ELEVATIONS SHOWN HEREON ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 1988)

L:\SURVEY\PROJECTS\152900 COCONUT ISLE DR\CADD\DWG\TOPO COCO.DWG Friday, October 09, 2015 1:03:04 PM

ENGINEER: #Name, Reg. #NO. REG. No. #NO. DATE #DATE

TEL: #Tel
FAX: #Fax

DRAWN BY: E. AZCONA
DATE: 10/09/2015
DESIGNED BY:
SCALE: 1" = 40'
CHECKED BY:
FIELD BOOK: MEI 090

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 20150029.000
COCONUT ISLE DR.

TOPOGRAPHIC SURVEY
COCONUT ISLE/ SE 18th ST.

SHEET NO. 2 OF 1

TOTAL: 2

CAD FILE: TOPO COCO

DRAWING FILE NO. 152900-002-TSRV

FINANCE DEPARTMENT

PRE-PROPOSAL MEETING SIGN-IN SHEET

WE BUILD COMMUNITY

DATE: 11/19/2018 **TIME:** 10:00 ⦿ AM ○ PM

OPENING DATE: 12/11/2018 **PROCUREMENT CONTACT:** Ginah Joseph

ITB #: 12201-293 **ITB TITLE:** Coconut Isle Bridge Replacement (P12089)

NAME	COMPANY	PHONE	EMAIL
Ginah Joseph	COFL	954-828-4797	gjoseph@fortlauderdale.gov
Connie Haymon	COFL	954-828-7150	chaymon@fortlauderdale.gov
Ronald Sanchez	H&H	954-661-2032	rsanchez@hardesty-hanover.com
Randy CROPP	CONED GRAHAM	561-310-7211	RCROPP@CONEGRAHAM.COM
JOHN ZELENKA	KIEWIT	404-849-6879	JOHN.ZELENKA@KIEWIT.COM
Ana Ziegler	CITY	850 596 6776	
Steve MUNZANZA	ANZAC	305.669.1996	steve@anzaccontractors.com
Bobby Brown	Ebsery Foundation	305 439 9250	Bbrown@EbseryFoundationco.com

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
4400 PGA BLVD, SUITE 500
PALM BEACH GARDENS, FLORIDA 33410

July 13, 2018

REPLY TO ATTENTION OF

Regulatory Division
South Permits Branch
Palm Beach Gardens Permits Section
SAJ-2016-01056 (NW-KAE)

City of Fort Lauderdale
c/o Raymond Nazaire
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

Dear Mr. Nazaire:

The U.S. Army Corps of Engineers (Corps) assigned your application for a Department of the Army permit, which the Corps received on January 11, 2018, the file number SAJ-2016-01056. A review of the information and drawings provided indicates that the proposed work would result in improvements in association with the replacement of the existing bridge crossing the Grande Canal. The proposed project includes installing 133.3 linear feet of seawall, backfilling 0.23 acres (approximately 158 cubic yards) and installation of eight concrete piles. The proposed replacement will be top down, eliminating the need for barges. The project is located at the Coconut Isles Bridge crossing over the Grande Canal, Section 11, Township 50 South, Range 42 East, in Fort Lauderdale, Broward County, Florida.

Your project, as depicted on the enclosed drawings, is authorized by Nationwide Permit (NWP) Number 14. In addition, project specific conditions have been enclosed. This verification is valid until **March 18, 2022**. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. Please access the U.S. Army Corps of Engineers' (Corps) Jacksonville District's Regulatory Internet page to access Internet links to view the Final Nationwide Permits, Federal Register Vol. 82, dated January 6, 2017, specifically pages 1983 to 2008, and the table of Regional Conditions. The Internet page address is:

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

Please be aware this Internet address is case sensitive and should be entered as it appears above. Once there you will need to click on “Source Book”; and, then click on “Nationwide Permits.” These files contain the description of the Nationwide Permit

authorization, the Nationwide Permit general conditions, and the regional conditions, which apply specifically to this verification for NWP 14. Enclosed is a list of the six General Conditions, which apply to all Department of the Army authorizations. You must comply with all of the special and general conditions and any project specific condition of this authorization or you may be subject to enforcement action. In the event you have not completed construction of your project within the specified time limit, a separate application or re-verification may be required.

The following special conditions are included with this verification:

1. Reporting Address: All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Special Projects and Enforcement Branch, 4400 PGA Boulevard, Suite 500, Palm Beach Gardens, Florida 33410 or for electronic mail saj-rd-enforcement@usace.army.mil (not to exceed 10 MB). The Permittee shall reference this permit number, SAJ-2016-01056 (NW-KAE), on all submittals.

2. Self-Certification: Within 60 days of completion of the work authorized by this permit, the Permittee shall complete the attached “Self-Certification Statement of Compliance” form (Attached) and submit it to the Corps. In the event that the completed work deviates in any manner from the authorized work, the Permittee shall describe the deviations between the work authorized by this permit and the work as constructed on the “Self-Certification Statement of Compliance” form. The description of any deviations on the “Self-Certification Statement of Compliance” form does not constitute approval of any deviations by the Corps.

3. Erosion Control: Prior to the initiation of any work authorized by this permit, the Permittee shall install erosion control measures along the perimeter of all work areas to prevent the displacement of fill material outside the work area into waters of the United States. Immediately after completion of the final grading of the land surface, all slopes, land surfaces, and filled areas shall be stabilized using sod, degradable mats, barriers, or a combination of similar stabilizing materials to prevent erosion. The erosion control measures shall remain in place and be maintained until all authorized work is completed and the work areas are stabilized.

4. Fill Material: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete block with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.

5. Eastern Indigo Snake Protection Measures and Inspection: Permittee shall comply with U.S. Fish and Wildlife Service's “Standard Protection Measures for the Eastern Indigo Snake” dated August 12, 2013, as provided as an Attachment of this permit. All gopher tortoise burrows, active or inactive, shall be evacuated prior to site manipulation in the vicinity of the burrow. If excavating potentially occupied burrows, active or inactive, individuals must first obtain state authorization via a Florida Fish and Wildlife Conservation Commission (FWC) Authorized Gopher Tortoise Agent permit. The excavation method selected shall minimize the potential for injury of an indigo snake. The Permittee shall follow the excavation guidance provided in the most current FWC Gopher Tortoise Permitting Guidelines found at http://myfwc.com/gophertortoise. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Holes, cavities, and snake refugia other than gopher tortoise burrows shall be inspected each morning before planned site manipulation of a particular area, and if occupied by an indigo snake, no work shall commence until the snake has vacated the vicinity of the proposed work.

6. Agency Changes/Approvals: Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee’s responsibility to request a modification of this permit from the Palm Beach Gardens Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for modification of this permit.

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

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

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

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

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

8. **Project Design Criteria (PDCs) for In-Water Activities:** The Permittee shall comply with National Marine Fisheries Service's "PDCs for In-Water Activities" dated November 20, 2017 (Attached).

9. **Daylight Hours:** All activities must be completed during daylight hours.

10. The Permittee shall comply with the "Standard Manatee Conditions for In-Water Work – 2011" (Attached).

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

If you are unable to access the internet or require a hardcopy of any of the conditions, limitations, or expiration date for the above referenced NWP, please contact Kelly Egan by telephone at 561-472-3514.

Thank you for your cooperation with our permit program. The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to complete our automated Customer Service Survey at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. Please be aware this Internet address is case sensitive; and, you will need to enter it exactly as it appears above. Your input is appreciated – favorable or otherwise.

Sincerely,

Kelly Egan

Kelly Egan
Project Manager

Enclosures
Project Drawings
Self-Certification
Standard Manatee Conditions for In-Water Work – 2011
PDCs for In-Water Activities

GENERAL CONDITIONS
33 CFR PART 320-330

1. The time limit for completing the work authorized ends on **March 18, 2022**.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort of if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow a representative from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

DRAWING INDEX

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G03	GENERAL PLAN AND ELEVATION	
G04	STRUCTURE PLAN	
G05	SUPERSTRUCTURE SECTION	
G06	APPROACH SLAB SECTION	
G07	FINISH GRADE ELEVATIONS	
G08	CONSTRUCTION PHASING PLAN	
G09	CONSTRUCTION PHASING SECTION	
G10	UTILITY PHASING PLAN	
001	ROADWAY PLAN SHEET	
002	TEMPORARY TRAFFIC CONTROL	
S01	BORING SHEETS	
S02	FOUNDATION LAYOUT	
S03	END BENT 1 PLAN AND ELEVATION	
S04	END BENT 1 DETAILS	
S05	END BENT 2 PLAN AND ELEVATION	
S06	END BENT 2 DETAILS	
S07	FLAT SLAB DETAILS	
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S10	BARRIER PLAN AND SECTIONS	
S11	TEMPORARY SUPPORT P & E	
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S13	SEAWALL NOTES	
S14	SEAWALL PLAN	
S15	SEAWALL ELEVATION	
S16	SEAWALL DETAILS	
S17	LOAD RATING	
	* OMITTED IN 60% SUBMISSION	

G:\PROJECTS\2950.01 FT. LAUDERDALE COCONUT ISLE\40_PNL_DES\CADD\12089-000-036COVR.DWG

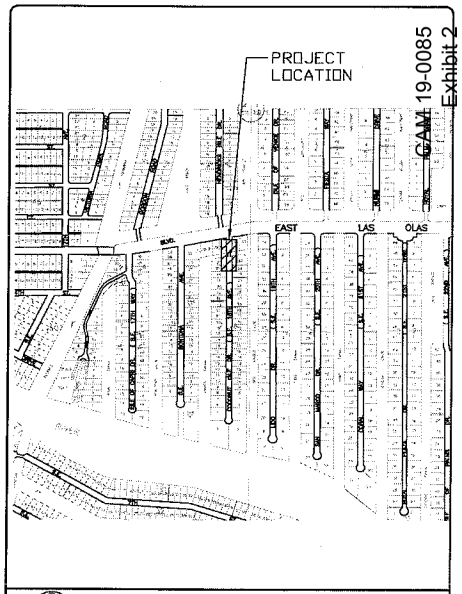
BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & BLDG. PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
SWM No.: N/A FIL No.: DF16-1069
EHP No.: 06-0734-P Issued: 05/09/2016
EXHIBIT 1 of 2 EXPIRES 18 MONTHS AFTER ISSUANCE

CITY OF FORT LAUDERDALE

PROJECT #12089
COCONUT ISLE
BRIDGE REPLACEMENT

COCONUT ISLE DRIVE OVER GRANDE CANAL
FORT LAUDERDALE, FLORIDA

Hardesty & Hanover
1000 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119



NORTH LOCATION SKETCH

PROJECT #12089
COCONUT ISLE
BRIDGE REPLACEMENT
COCONUT ISLE DRIVE OVER GRANDE CANAL

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

FORT LAUDERDALE CITY COMMISSION

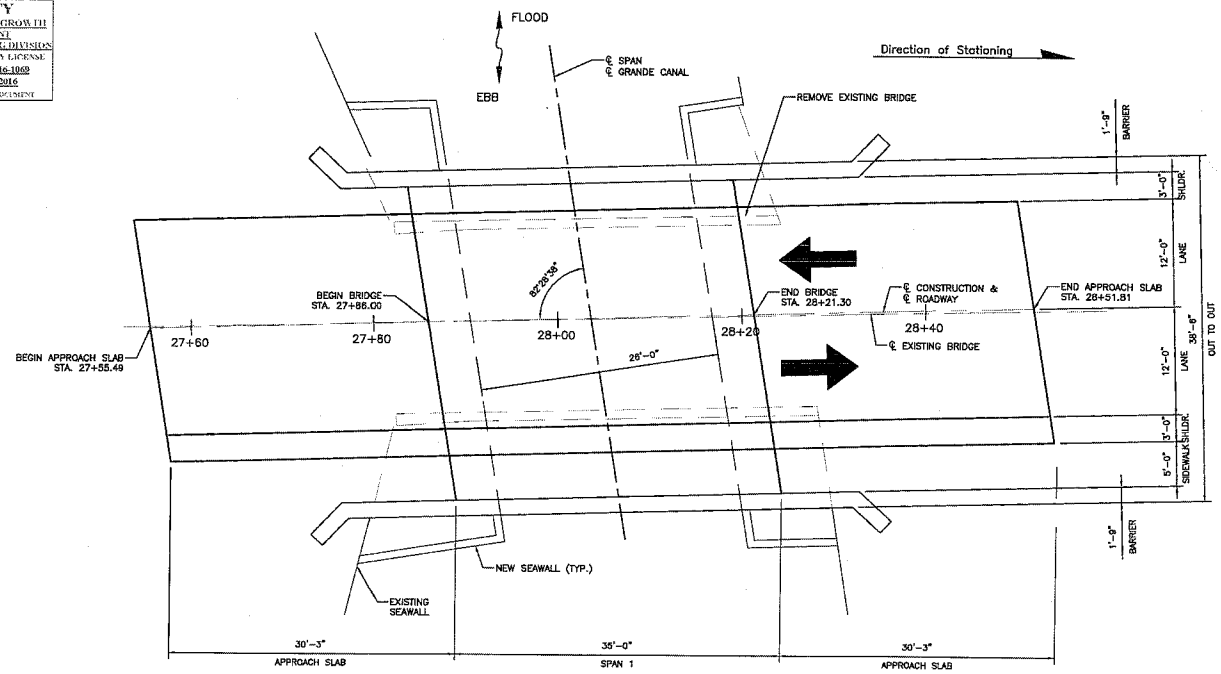
JOHN P. "JACK" SEILER	MAYOR
BRUCE G. ROBERTS	COMMISSIONER - DISTRICT I
DEAN J. TRANTALIS	COMMISSIONER - DISTRICT II
ROBERT L. McKINZIE	COMMISSIONER - DISTRICT III
ROMNEY ROGERS	COMMISSIONER - DISTRICT IV

RAYMOND NAZAIRE, P.E., CGC	PROJECT MANAGER	(954) 828-8954
RONALD SANCHEZ, P.E.	CONSULTANT PROJECT MANAGER	(954) 835-9119

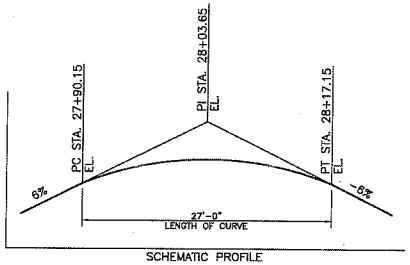
DATE: 01/15/16
CAD FILE: 12089-000-036COVR
DRAWING FILE No.: 4-XXX-XX

NOT FOR CONSTRUCTION

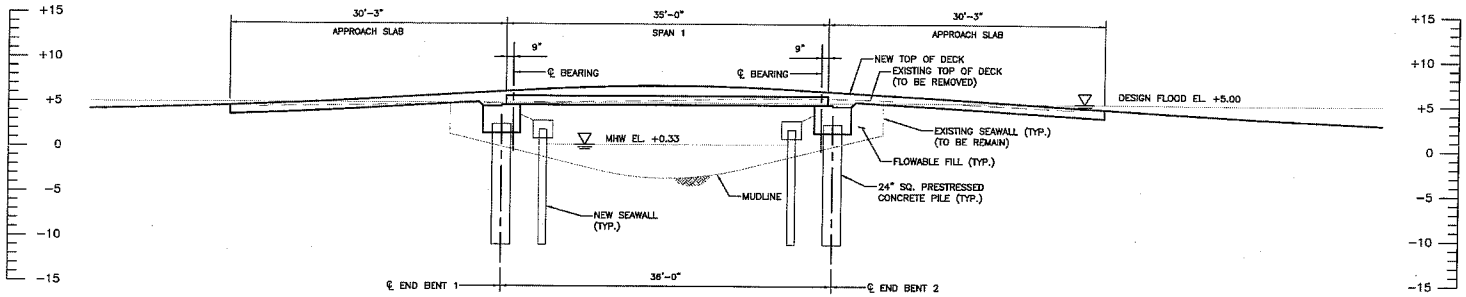
BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & HABITAT PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
NWM No.: N/A — ERL No.: DF16-1069
FRP No.: 06-0732-P — Issued: 05/09/2016
EXHIBIT 2 of 2 EXHIBITS AS PROVIDED IN DOCUMENT



PLAN



SCHEMATIC PROFILE
VERTICAL ALIGNMENT @ ℄ CONSTRUCTION



ELEVATION

Hardesty & Hanover
1900 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-3119

NOT FOR CONSTRUCTION OR BID

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
GENERAL PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

NO.	DATE	BY	CHK'D	DESCRIPTION

REVISIONS

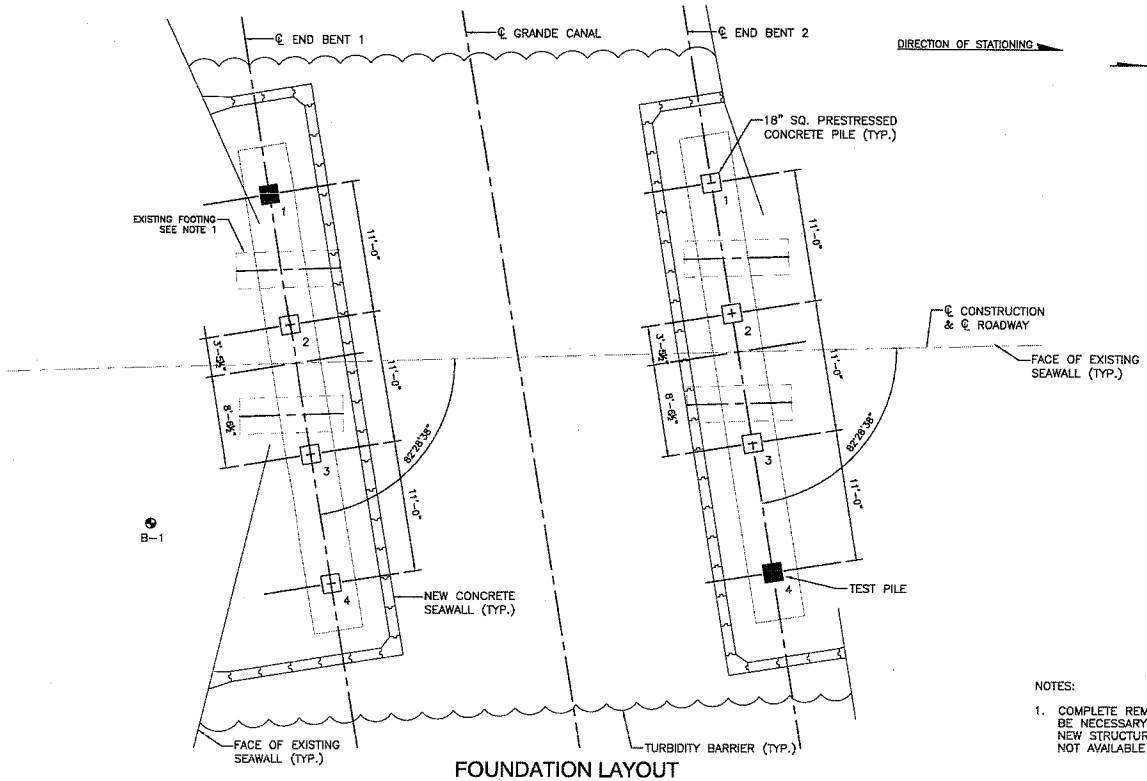
CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

DRAWN BY: TB — DATE: 01/15/16
DESIGNED BY: RS — SCALE:
CHECKED BY:
FIELD BOOK:

PROJECMAN: Ronald Sanchez
REG. No: 58923
DATE: 09/26/16
TEL: (954) 828-5118
FAX: (954) 828-5119

SHEET NO. G03 OF 10
TOTAL: 30
CAD FILE: 12089-G03-PLAN
DRAWING FILE NO. 4-XXX-XX

BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & BLDG. PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
SWM No.: N/A KBL No.: DF16-1069
ERP No.: 06-07324-P Issued: 05/09/2016
EXHIBIT 1 of 2 EXPIRES AS INDICATED IN INSTRUMENT



FOUNDATION LAYOUT

NOTES:

1. COMPLETE REMOVAL OF EXISTING STRUCTURE MAY BE NECESSARY TO FACILITATE INSTALLATION OF NEW STRUCTURE. EXISTING BRIDGE PLANS ARE NOT AVAILABLE

PILE CUT-OFF ELEVATIONS				
PILE NO.	1	2	3	4
END BENT 1	1.747	1.967	1.877	1.657
END BENT 2	1.747	1.967	1.877	1.657

PILE DATA TABLE

INSTALLATION CRITERIA								DESIGN CRITERIA						
BENT NUMBER	PILE SIZE (IN)	NOMINAL BEARING CAPACITY (TONS)	TENSION CAPACITY (TONS)	MINIMUM TIP ELEVATION (FT)	TEST PILE LENGTH (FT)	REQ'D JET ELEVATION (FT)	REQ'D PREFORM ELEV. (FT)	FACTORED DESIGN LOAD (TONS)	DOWN DRAG (TONS)	TOTAL SCOUR RESISTANCE (TONS)	NET SCOUR RESISTANCE (TONS)	100 YEAR SCOUR ELEVATION (FT)	LONG TERM SCOUR ELEVATION (FT)	RESISTANCE FACTOR
END BENT 1	18	282	N/A	-30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65
END BENT 2	18	282	N/A	-30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65

Hardesty & Hanover
1980 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 236-5119

NOT FOR CONSTRUCTION OR BID

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FOUNDATION LAYOUT
COCONUT ISLE DRIVE OVER GRANDE CANAL

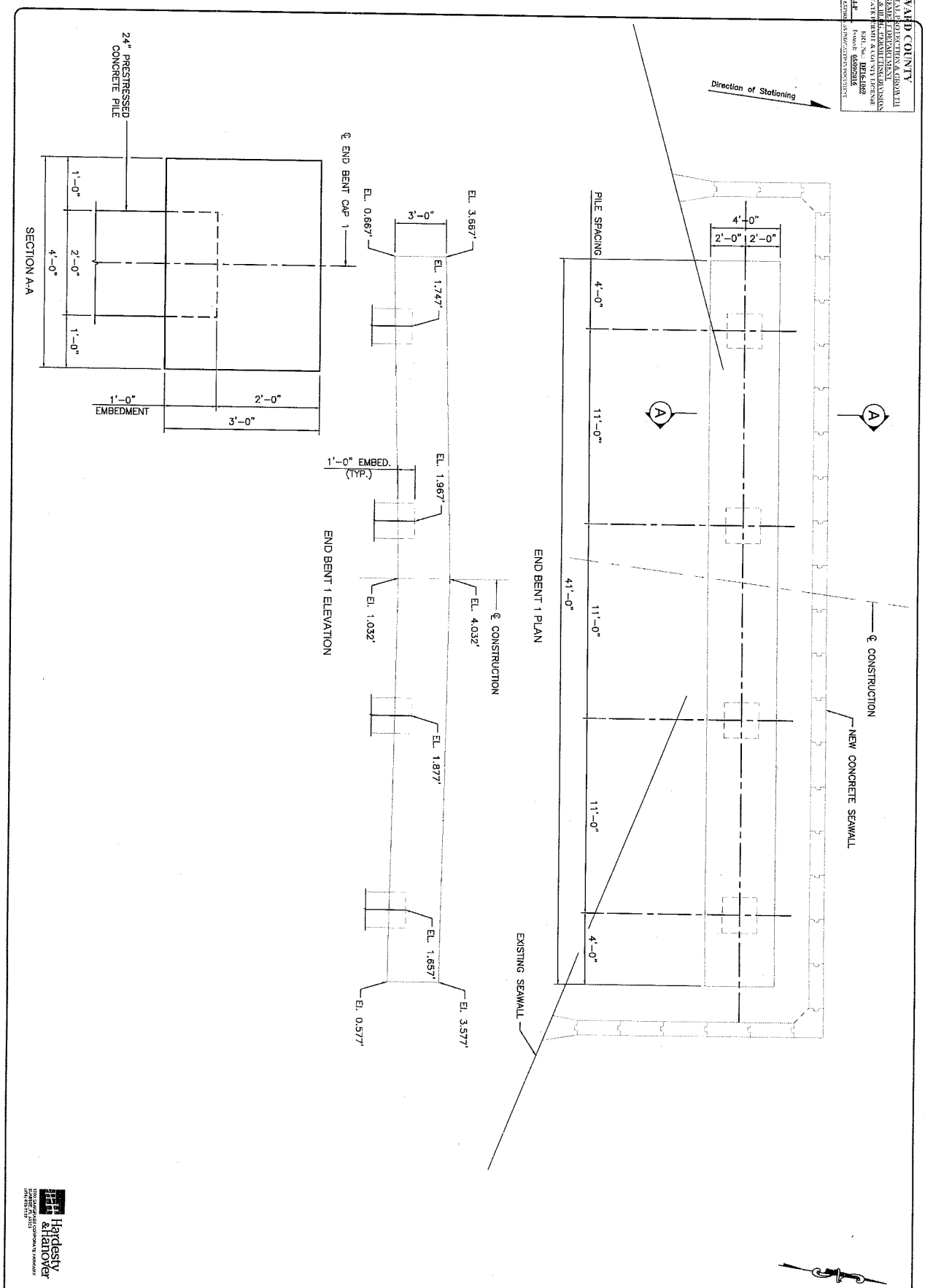
REVISIONS			
NO.	DATE	BY	CHK'D	DESCRIPTION

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

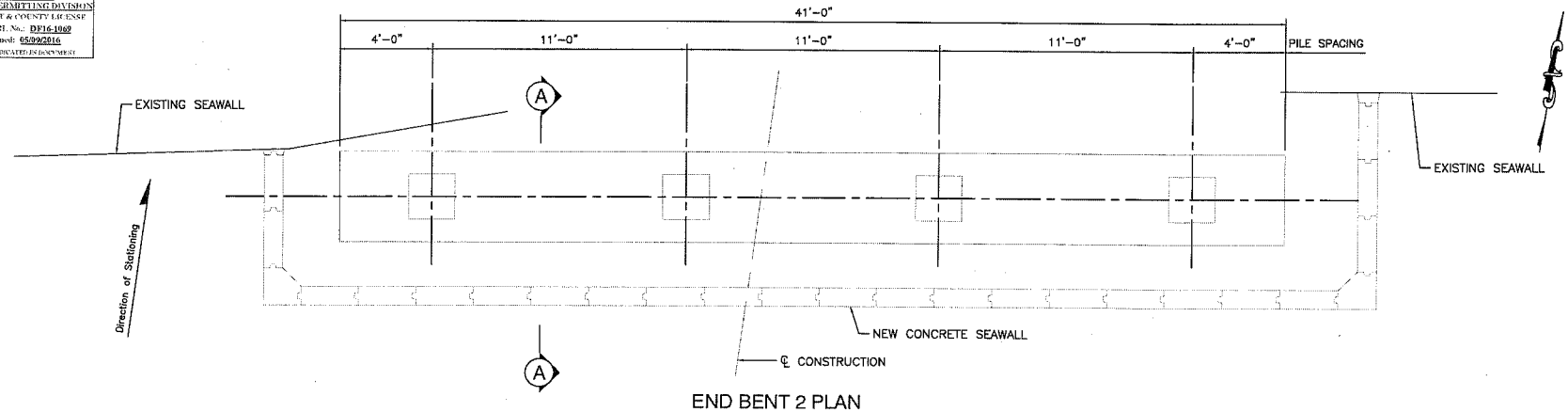
ENGINEER: RONALD SANCHEZ
REG. No.: 49453
DATE: 04/20/16
TEL: (954) 828-5118
FAX: (954) 828-5110

DRAWN BY: TB
DATE: 04/27/16
DESIGNED BY: RS
SCALE:
CHECKED BY:
FIELD BOOK:

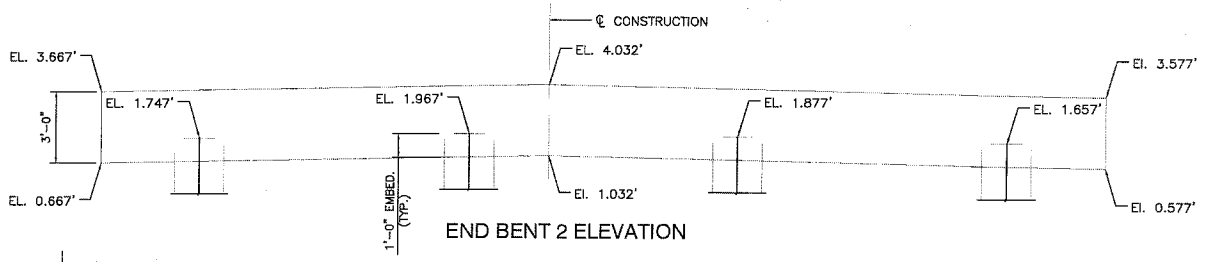
SHEET NO. S02 OF 17
TOTAL: 30
CAD FILE: 12089-S02-FOUN
DRAWING FILE NO. 4-XXX-XX


24" PRESTRESSED CONCRETE PILE
1'-0"
2'-0"
1'-0"
4'-0"
SECTION A-A
1'-0"
EMBEDMENT
2'-0"
3'-0"
℄ END BENT CAP 1
EL. 0.667'
3'-0"
EL. 3.667'
EL. 1.747'
1'-0" EMBED. (TYP.)
EL. 1.967'
END BENT 1 ELEVATION
EL. 1.032'
EL. 4.032'
℄ CONSTRUCTION
EL. 1.877'
EL. 1.657'
EL. 0.577'
EL. 3.577'
PILE SPACING
4'-0"
11'-0"
41'-0"
11'-0"
11'-0"
4'-0"
END BENT 1 PLAN
EXISTING SEAWALL
4'-0"
2'-0"
2'-0"
℄ CONSTRUCTION
NEW CONCRETE SEAWALL
Direction of Stationing
A
A
Hardesty & Hanover
NOT FOR CONSTRUCTION OR BID
BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 1 PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL
SHEET NO. S03
REVISIONS
NO. DATE BY CHK'D DESCRIPTION
CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301
DRAWN BY: TB
DATE: 01/15/16
DESIGNED BY: RS
SCALE:
CHECKED BY:
FIELD BOOK:
ENGINEER: RONALD SANCHEZ
REG. No: 65923
DATE: 09/20/16

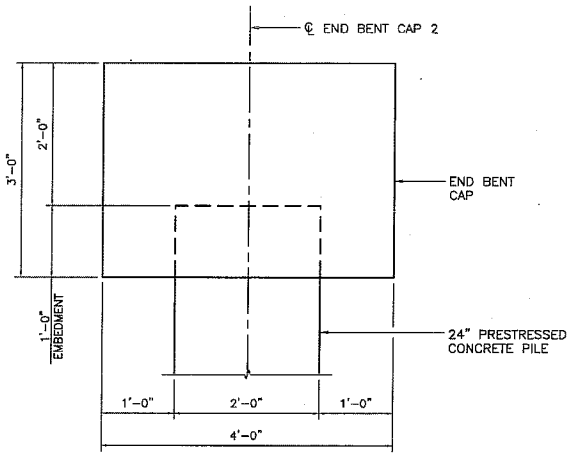
BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & BLDG. PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
SWM No.: N/A ERL No.: DF16-1069
ERP No.: 06-07324-P Issued: 05/09/2016
EXHIBIT 5 of 9 PAGES AS INDICATED IN DOCUMENT



END BENT 2 PLAN



END BENT 2 ELEVATION



SECTION A-A

NOT FOR CONSTRUCTION OR BID

Hardesty & Hanover
1600 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 535-9119

ENGINEER: DONALD SANCHEZ
REG. No.: 61805
DATE: 09/06/16

DRAWN BY: TB
DATE: 01/15/16
DESIGNED BY: RS
SCALE:
CHECKED BY:
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

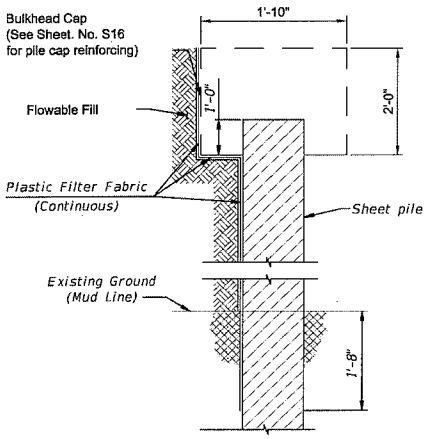
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
END BENT 2 PLAN AND ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

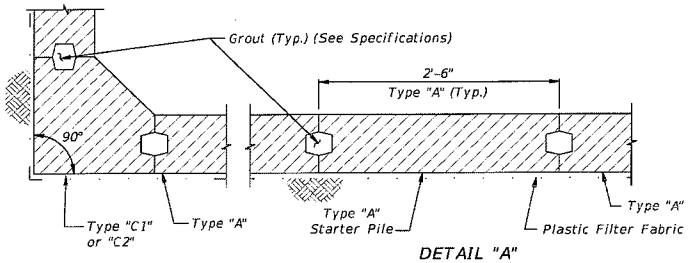
SHEET NO. S05 OF 17
TOTAL: 30
CAD FILE: 12089-S05-PLAN
DRAWING FILE NO. 4-XXX-XX

CAM 19-0085
Exhibit 2
Page 37 of 61

BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & BLDG. PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
SWM No.: N/A ERL No.: DF16-1069
FRP No.: 06-07324-P Issued: 08/09/2016
EXHIBIT 6 of 2 EXPIRES AS INDICATED ON DOCUMENT

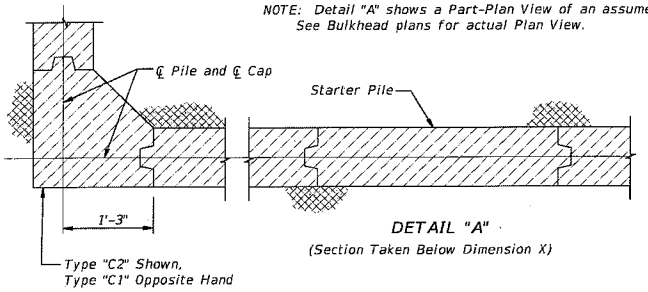


SECTION THRU BULKHEAD
(Showing Plastic Filter Fabric)



DETAIL "A"
(Cap and Anchoring System Not Shown)
(Section Taken Above Dimension X)

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead.
See Bulkhead plans for actual Plan View.



DETAIL "A"
(Section Taken Below Dimension X)

SHEET PILE DESIGN CRITERIA AND NOTES

DESCRIPTION:
This Design Standard includes details for five types of piles with two thicknesses.
Types "B1", "B2", "C1" and "C2" piles (corner piles) are of reinforced concrete construction, and Type "A" is of prestressed concrete construction. The piles shall be manufactured, cured and installed in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)
CONCRETE

Class:	V (Special) for slightly and moderately aggressive environments V (Special w/ Silica Fume) for extremely aggressive environment
Unit weight:	150 pcf
Modulus of Elasticity:	Based on the use of Florida limerock concrete

REINFORCING STEEL
ASTM A615 Grade 60

PRESTRESSING STEEL
ASTM A416 Grade 270 (Low-Relaxation Strand)

DESIGN PARAMETERS:
Type "A"

Concrete Compressive Strength at release of prestressing:	4000 psi minimum
Uniform compression after prestressing losses:	1000 psi minimum
Pick-up, Storage and Transportation:	0.0 psi tension with 1.5 times pile self weight

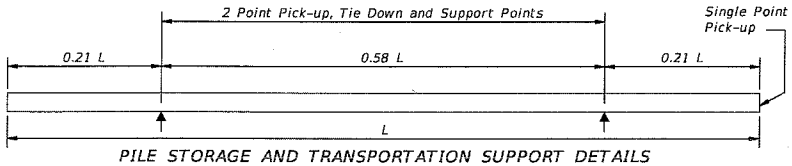
Types "B1", "B2", "C1" & "C2"
Pick-up, Storage and Transportation: Minimum compressive strength f'ci ≥ 4000 psi required.

ENVIRONMENT:
The pile designs are applicable to all Environments.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to 1'-8" below Existing Ground (Mudline)..

PILE PICK-UP AND HANDLING:
Type "A"
Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.
Types "B1", "B2", "C1" & "C2"
Two point pick-up for lifting out of forms & two point support for storage & transportation.
Single point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to ½" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5½". No changes shall be made to the tongues or grooves.



PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS

Hardesty & Hanover
1090 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119

NOT FOR CONSTRUCTION OR BID

ENGINEER: RAUL A. SANCHEZ
REG. No: 059925
DATE: 06/26/16

DRAWN BY: TB
DATE: 01/15/16
DESIGNED BY: RS
SCALE:
CHECKED BY:
FIELD BOOK:

CAM 19-0085
Exhibit 2

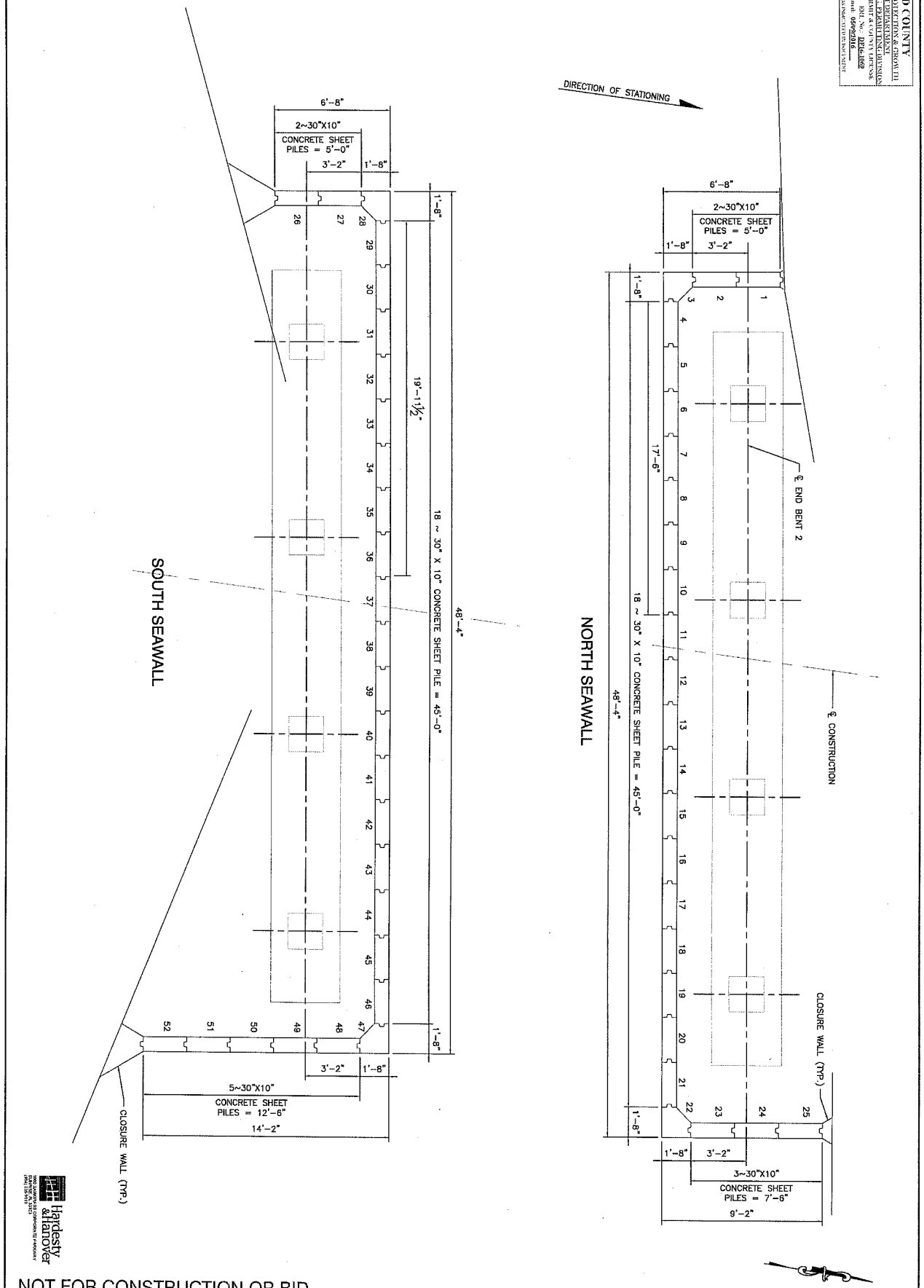
CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS			
NO.	DATE	BY	CHKD	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SEAWALL NOTES AND DETAILS
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S13 OF 17
TOTAL: 30
CAD FILE: 12089-S13-SEAW
DRAWING FILE NO. 4-XXX-XX

BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & PARK PERMITTING DIVISION
1801 NE 38th STREET, FORT LAUDERDALE, FLORIDA 33308
FIRM No.: N/A FDOT No.: DF44-1069
FBP No.: 06-0732-P Permit: 06-0905-016
PERMIT 2 of 2 SHEETS (NOT VALID WITHOUT ALL SHEETS)



Hardesty & Hanover
1715 NW 167th Street, Suite 200
Miami, Florida 33169
(305) 623-1800

NOT FOR CONSTRUCTION OR BID

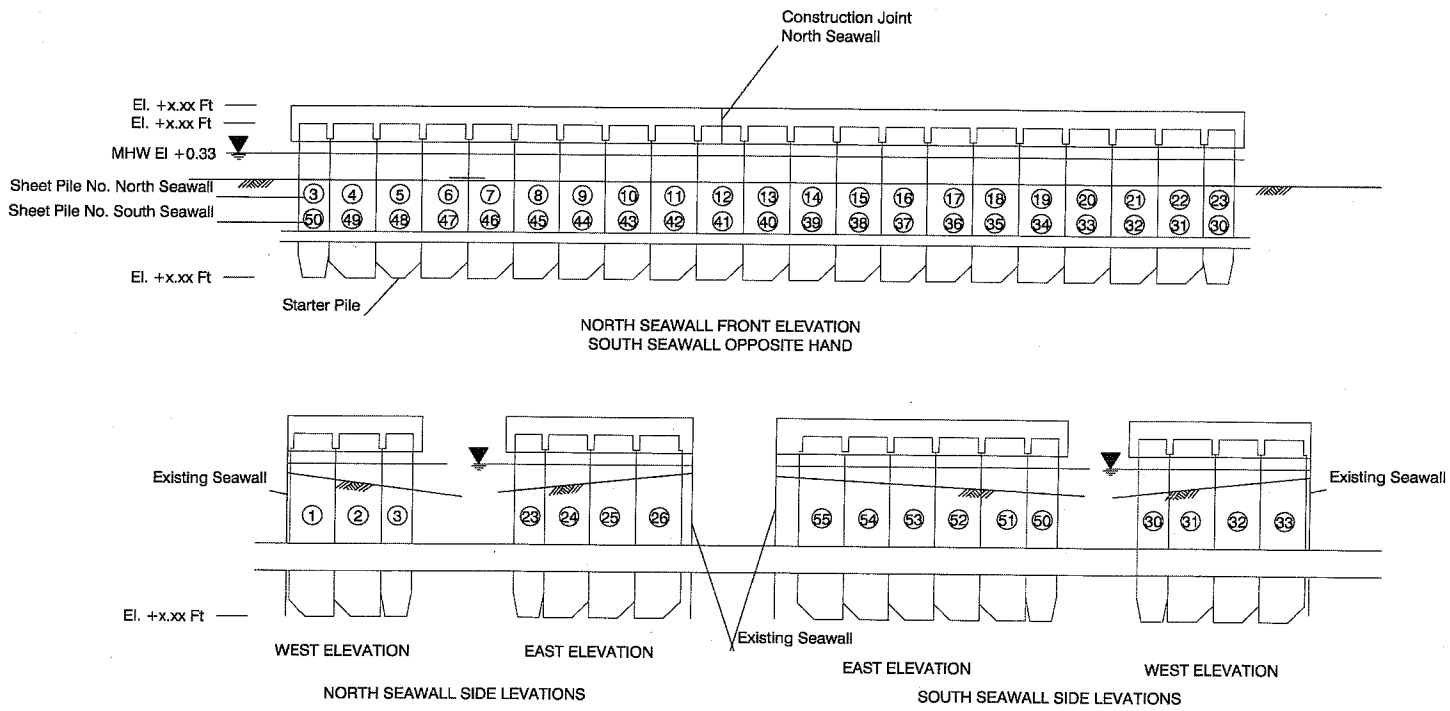
SHEET NO. S14 OF 17 30	PROJECT # 12089 COCONUT ISLE BRIDGE REPLACEMENT SEAWALL PLAN COCONUT ISLE DRIVE OVER GRANDE CANAL	REVISIONS: NO. / DATE / BY / CHK'D / DESCRIPTION	CITY OF FORT LAUDERDALE PUBLIC WORKS DEPARTMENT ENGINEERING & ARCHITECTURE 100 North Andrews Avenue, Fort Lauderdale, Florida 33301

TOTAL: 30
CAD FILE: 12089-S14-SEAW
DRAWING FILE NO.: 4-XXX-XX

DRAWN BY: TB — DATE: 01/15/16
DESIGNED BY: RS — SCALE:
CHECKED BY:
FIELD BOOK:

ENGINEER: RONALD SANCHEZ
REG. No: 59523
DATE: 09/25/15
TEL: (954) 535-2119
FAX: (954) 535-2118

BROWARD COUNTY
ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT
ENV. LICENSING & BLDG. PERMITTING DIVISION
COMBINATION STATE PERMIT & COUNTY LICENSE
SWM No.: N/A — ERL No.: DP16-1069
ERP No.: 06-0732-P — Issued: 05/09/2016
EXHIBIT 8 of 9 EXPIRES AS INDICATED IN DOCUMENT



NOT FOR CONSTRUCTION OR BID

Hardesty & Hanover
1090 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 236-7199

ENGINEER: RONALD SANCHEZ
REG. No: 69923
DATE: 04/06/16
TEL. (954) 828-7198
FAX: (954) 828-7180

DRAWN BY: TB
DATE: 01/15/16
DESIGNED BY: RS
SCALE:
CHECKED BY:
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

NO.	DATE	BY	CHKD	DESCRIPTION

REVISIONS

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
SEAWALL ELEVATION
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S15 OF 17
TOTAL: 30
CAD FILE: 12089-S15-SEAW
DRAWING FILE NO. 4-XXX-XX

CAM 19-0085
Exhibit 2

BROWARD COUNTY

ENVIRONMENTAL PROTECTION & GROWTH MANAGEMENT DEPARTMENT

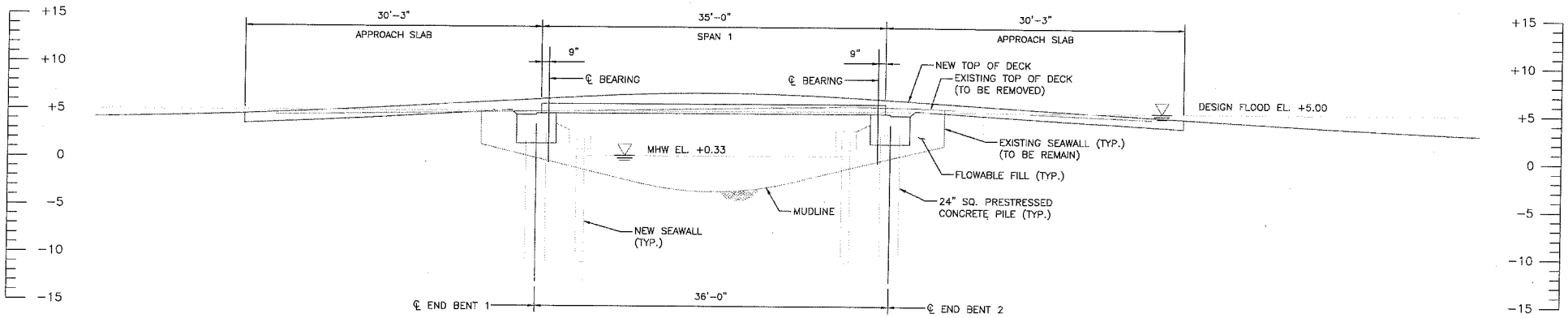
ENV. LICENSING & BLDG. PERMITTING DIVISION

COMBINATION STATE PERMIT & COUNTY LICENSE

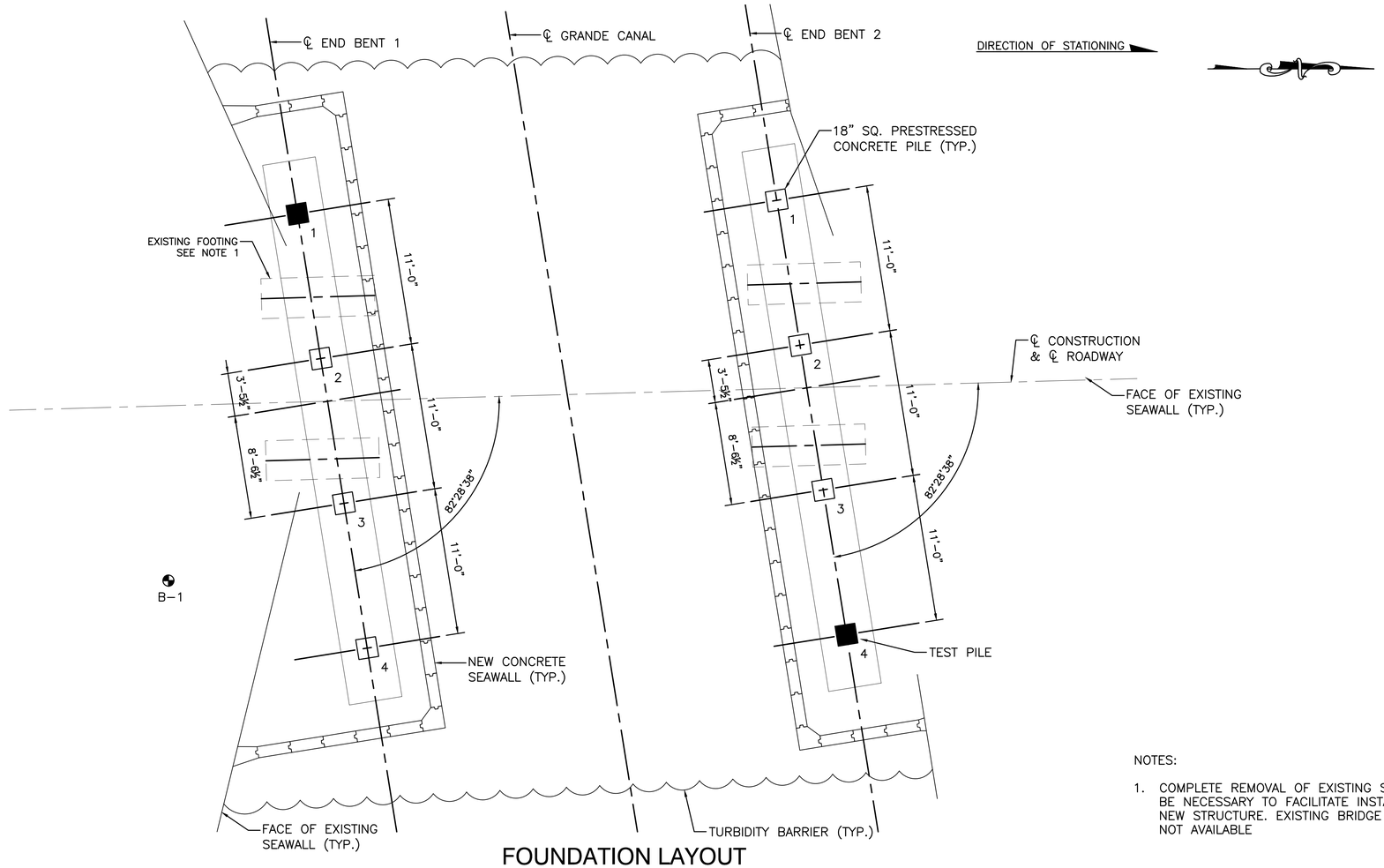
SWM No.: N/A **ERL No.: DF16-1069**

ERP No.: 06-07324-P **Issued: 05/09/2016**

EXHIBIT 9 of 9 EXPIRES AS INDICATED IN DOCUMENT



ELEVATION



FOUNDATION LAYOUT

NOTES:

1. COMPLETE REMOVAL OF EXISTING STRUCTURE MAY BE NECESSARY TO FACILITATE INSTALLATION OF NEW STRUCTURE. EXISTING BRIDGE PLANS ARE NOT AVAILABLE

PILE CUT-OFF ELEVATIONS

PILE NO.	1	2	3	4
END BENT 1	1.747	1.967	1.877	1.657
END BENT 2	1.747	1.967	1.877	1.657

PILE DATA TABLE

INSTALLATION CRITERIA								DESIGN CRITERIA						
BENT NUMBER	PILE SIZE (IN)	NOMINAL BEARING CAPACITY (TONS)	TENSION CAPACITY (TONS)	MINIMUM TIP ELEVATION (FT)	TEST PILE LENGTH (FT)	REQ'D JET ELEVATION (FT)	REQ'D PREFORM ELEV. (FT)	FACTORED DESIGN LOAD (TONS)	DOWN DRAG (TONS)	TOTAL SCOUR RESISTANCE (TONS)	NET SCOUR RESISTANCE (TONS)	100 YEAR SCOUR ELEVATION (FT)	LONG TERM SCOUR ELEVATION (FT)	RESISTANCE FACTOR
END BENT 1	18	282	N/A	-30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65
END BENT 2	18	282	N/A	-30.0	80	N/A	N/A	347	N/A	N/A	N/A	N/A	N/A	0.65

Hardesty & Hanover
1000 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119

NOT FOR CONSTRUCTION OR BID

ENGINEER:
RONALD SANCHEZ
REG. No: 59923
DATE: 09/25/15
TEL: (954) 835-9119
FAX: (954) 835-9130

DRAWN BY: TB	DATE: 04/27/16
DESIGNED BY: RS	SCALE:
CHECKED BY:	
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
FOUNDATION LAYOUT
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO.	OF
S02	17
TOTAL:	30
CAD FILE: 12089-S02-FOUN	
DRAWING FILE NO. 4-XXX-XX	

SELF-CERTIFICATION STATEMENT OF COMPLIANCE

Permit Number: SAJ-2016-1056

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

_____

_____

Telephone Number:_____

Location of the Work:_____

_____

Date Work Started:_____ Date Work Completed:_____

PROPERTY IS INACCESSIBLE WITHOUT PRIOR NOTIFICATION: YES _____ NO_____

TO SCHEDULE AN INSPECTION PLEASE CONTACT _____
AT _____

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

_____

_____

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

Describe Mitigation completed (if applicable): _____

_____

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

_____

_____

****

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

_____
Signature of Permittee

_____
Date

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE
U.S. Fish and Wildlife Service
August 12, 2013

The eastern indigo snake protection/education plan (Plan) below has been developed by the U.S. Fish and Wildlife Service (USFWS) in Florida for use by applicants and their construction personnel. At least **30 days prior** to any clearing/land alteration activities, the applicant shall notify the appropriate USFWS Field Office via e-mail that the Plan will be implemented as described below (North Florida Field Office: jaxregs@fws.gov; South Florida Field Office: verobeach@fws.gov; Panama City Field Office: panamacity@fws.gov). As long as the signatory of the e-mail certifies compliance with the below Plan (including use of the attached poster and brochure), no further written confirmation or "approval" from the USFWS is needed and the applicant may move forward with the project.

If the applicant decides to use an eastern indigo snake protection/education plan other than the approved Plan below, written confirmation or "approval" from the USFWS that the plan is adequate must be obtained. At least 30 days prior to any clearing/land alteration activities, the applicant shall submit their unique plan for review and approval. The USFWS will respond via e-mail, typically within 30 days of receiving the plan, either concurring that the plan is adequate or requesting additional information. A concurrence e-mail from the appropriate USFWS Field Office will fulfill approval requirements.

The Plan materials should consist of: 1) a combination of posters and pamphlets (see **Poster Information** section below); and 2) verbal educational instructions to construction personnel by supervisory or management personnel before any clearing/land alteration activities are initiated (see **Pre-Construction Activities** and **During Construction Activities** sections below).

POSTER INFORMATION

Posters with the following information shall be placed at strategic locations on the construction site and along any proposed access roads (a final poster for Plan compliance, to be printed on 11" x 17" or larger paper and laminated, is attached):

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands

and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION UNDER FEDERAL AND STATE LAW: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

IF YOU SEE A <u>LIVE</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the live eastern indigo snake sufficient time to move away from the site without interference;
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A <u>DEAD</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

Telephone numbers of USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

PRE-CONSTRUCTION ACTIVITIES

1. The applicant or designated agent will post educational posters in the construction office and throughout the construction site, including any access roads. The posters must be clearly visible to all construction staff. A sample poster is attached.

2. Prior to the onset of construction activities, the applicant/designated agent will conduct a meeting with all construction staff (annually for multi-year projects) to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if state and/or federal regulations are violated. An educational brochure including color photographs of the snake will be given to each staff member in attendance and additional copies will be provided to the construction superintendent to make available in the onsite construction office (a final brochure for Plan compliance, to be printed double-sided on 8.5” x 11” paper and then properly folded, is attached). Photos of eastern indigo snakes may be accessed on USFWS and/or FWC websites.

3. Construction staff will be informed that in the event that an eastern indigo snake (live or dead) is observed on the project site during construction activities, all such activities are to cease until the established procedures are implemented according to the Plan, which includes notification of the appropriate USFWS Field Office. The contact information for the USFWS is provided on the referenced posters and brochures.

DURING CONSTRUCTION ACTIVITIES

1. During initial site clearing activities, an onsite observer may be utilized to determine whether habitat conditions suggest a reasonable probability of an eastern indigo snake sighting (example: discovery of snake sheds, tracks, lots of refugia and cavities present in the area of clearing activities, and presence of gopher tortoises and burrows).

2. If an eastern indigo snake is discovered during gopher tortoise relocation activities (i.e. burrow excavation), the USFWS shall be contacted within one business day to obtain further guidance which may result in further project consultation.

3. Periodically during construction activities, the applicant’s designated agent should visit the project area to observe the condition of the posters and Plan materials, and replace them as needed. Construction personnel should be reminded of the instructions (above) as to what is expected if any eastern indigo snakes are seen.

POST CONSTRUCTION ACTIVITIES

Whether or not eastern indigo snakes are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS Field Office within 60 days of project completion. The report can be sent electronically to the appropriate USFWS e-mail address listed on page one of this Plan.

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

IF YOU SEE A LIVE EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site without interference.
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate U.S. Fish and Wildlife Service (USFWS) office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A DEAD EASTERN INDIGO SNAKE ON THE SITE:

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North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

Killing, harming, or harassing indigo snakes is strictly prohibited and punishable under State and Federal Law.

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

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PROTECTION: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

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Panama City ES Office – (850) 769-0552
South Florida ES Office – (772) 562-3909

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U.S. FISH & WILDLIFE SERVICE

August 12, 2013

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

Please read the following information provided by the U.S. Fish and Wildlife Service to become familiar with standard protection measures for the eastern indigo snake.

U.S. Army Corps of Engineers Jacksonville District's Programmatic Biological Opinion (JaxBO) Project Design Criteria (PDCs) for In-Water Activities

November 20, 2017

1) **(AP.7.) Education and Observation**: The permittee must ensure that all personnel associated with the project are instructed about the potential presence of species protected under the ESA and the Marine Mammal Protection Act (MMPA). All on-site project personnel are responsible for observing water-related activities for the presence of protected species. All personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species or marine mammals. To determine which species may be found in the project area, please review the relevant Protected Species List at: http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/index.html

2) **(AP.8.) Reporting** of interactions with protected species:
   a) Any collision(s) with and/or injury to any sea turtle, sawfish, whale, or sturgeon occurring during the construction of a project, shall be reported immediately to NMFS's Protected Resources Division (PRD) at (1-727-824-5312) or by email to takereport.nmfsser@noaa.gov and SAJ-RD-Enforcement@usace.army.mil.
   b) Smalltooth sawfish: Report sightings to 1-844-SAWFISH or email Sawfish@MyFWC.com
   c) Sturgeon: Report dead sturgeon to 1-844-STURG 911 (1-844-788-7491) or email nmfs.ser.sturgeonnetwork@noaa.gov
   d) Sea turtles and marine mammals: Report stranded, injured, or dead animals to 1-877-WHALE HELP (1-877-942-5343).
   e) North Atlantic right whale: Report injured, dead, or entangled right whales to the USCG via VHF Channel 16.

3) **(AP.9.) Vessel Traffic and Construction Equipment**: All vessel operators must watch for and avoid collision with species protected under the ESA and MMPA. Vessel operators must avoid potential interactions with protected species and operate in accordance with the following protective measures:

   a) *Construction Equipment*:
      i) All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while operating in water depths where the draft of the vessel provides less than a 4-foot (ft) clearance from the bottom, and in all depths after a protected species has been observed in and has departed the area.
      ii) All vessels will follow marked channels and/or routes using the maximum water depth whenever possible.
      iii) Operation of any mechanical construction equipment, including vessels, shall cease immediately if a listed species is observed within a 50-ft radius of

construction equipment and shall not resume until the species has departed the area of its own volition.

iv) If the detection of species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.

b) *All Vessels*:
   i) Sea turtles: Maintain a minimum distance of 150 ft.
   ii) North Atlantic right whale: Maintain a minimum 1,500-ft distance (500 yards).
   iii) Vessels 65 ft in length or longer must comply with the Right Whale Ship Strike Reduction Rule (50 CFR 224.105) which includes reducing speeds to 10 knots or less in Seasonal Management Areas (http://www.fisheries.noaa.gov/pr/shipstrike/).
   iv) Mariners shall check various communication media for general information regarding avoiding ship strikes and specific information regarding right whale sightings in the area. These include NOAA weather radio, USCG NAVTEX broadcasts, and Notices to Mariners.
   v) Marine mammals (i.e., dolphins, whales [other than North Atlantic right whales], and porpoises): Maintain a minimum distance of 300 ft.
   vi) When these animals are sighted while the vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until they have left the area.
   vii) Reduce speed to 10 knots or less when mother/calf pairs or groups of marine mammals are observed, when safety permits.

4) **(AP.10.) Turbidity Control Measures during Construction:** Turbidity must be monitored and controlled. Prior to initiating any of the work covered under this Opinion, the Permittee shall install turbidity curtains as described below. In some instances, the use of turbidity curtains may be waived by the USACE project manager if the project is deemed too minimal to generate turbidity (e.g., certain ATON installation, scientific survey device placement, marine debris removal) or if the current is too strong for the curtains to stay in place. Turbidity curtains specifications:

   a) Install floating turbidity barriers with weighted skirts that extend to within 1 ft of the bottom around all work areas that are in, or adjacent to, surface waters.
   b) Use these turbidity barriers throughout construction to control erosion and siltation and ensure that turbidity levels within the project area do not exceed background conditions.
   c) Position turbidity barriers in a way that does not block species' entry to or exit from designated critical habitat.
   d) Monitor and maintain turbidity barriers in place until the authorized work has been completed and the water quality in the project area has returned to background conditions.
   e) In the range of ESA-listed corals (St. Lucie Inlet, Martin County south to the Dry Tortugas and the U.S. Caribbean) and Johnson's seagrass (Turkey Creek/Palm

Bay south to central Biscayne Bay in the lagoon systems on the east coast of Florida):

i) Projects that include upland earth moving (e.g., grading to install a building or parking lot associated with a dock and seawall project), must install sediment control barriers to prevent any upland sediments from reaching estuarine or marine waters.
ii) The turbidity curtain requirement cannot be waived for any project that moves or removes sediment (e.g., dredging, auger to create a pile, trenching to install a cableline). If turbidity curtains are not feasible in an area based on site conditions such as water current, high wave action, or stormy conditions, the project must undergo individual Section 7 consultation and is not covered under this Programmatic Opinion.

5) **(AP.11.) Entanglement:** All turbidity curtains and other in-water equipment must be properly secured with materials that reduce the risk of entanglement of marine species (described below). Turbidity curtains likewise must be made of materials that reduce the risk of entanglement of marine species.

a) In-water lines (rope, chain, and cable, including the lines to secure turbidity curtains) must be stiff, taut, and non-looping. Examples of such lines are heavy metal chains or heavy cables that do not readily loop and tangle. Flexible in-water lines, such as nylon rope or any lines that could loop or tangle, must be enclosed in a plastic or rubber sleeve/tube to add rigidity and prevent the line from looping and tangling. In all instances, no excess line is allowed in the water.
b) Turbidity curtains and other in-water equipment must be placed in a manner that does not entrap species within the construction area or block access for them to navigate around the construction area.

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK
2011

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

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

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

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

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida, and to FWC at ImperiledSpecies@myFWC.com

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.

DEPARTMENT OF THE ARMY PERMIT TRANSFER REQUEST

PERMIT NUMBER: SAJ-2016-01056 (NW-KAE)

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

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

_____
(TRANSFEREE-SIGNATURE)

_____
(DATE)

_____
(NAME-PRINTED)

_____

_____
(MAILING ADDRESS)

_____
(CITY, STATE, ZIP CODE)

_____
(SUBDIVISION)

_____ _____
(LOT) **(BLOCK)**

_____
(STREET ADDRESS)

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Seventh District

909 SE 1st Ave. Ste 432
Miami, FL 33131-3028
Staff Symbol: (dpb)
Phone: (305) 415-6740
Fax: (305) 415-6763
Email: jennifer.n.zercher@uscg.mil

16591/FL
October 26, 2015

Mr. Ronald Sanchez
Hardesty & Hanover, LLC
1000 Sawgrass Corporate Parkway, Suite 544
Sunrise, FL 33323

Dear Mr. Sanchez:

This letter is in response to your email dated October 9, 2015 concerning the proposed construction of the Coconut Isles Drive Bridge across a Residential Canal (New River), at Broward County, Florida

The Coast Guard has determined that the Residential Canal (New River), at your project location (lat/long 26.119426, -80.121702) meets the criteria for advance approval per 33 CFR 115.70. A Coast Guard bridge permit will not be required for the proposed bridge project. Although an individual Coast Guard bridge permit is not required, the following stipulations apply:

1. You must comply with all applicable federal, state, and local laws and regulations.
2. Upon completion of construction provide, to this office, a set of "as-built" drawings which include horizontal and vertical clearance of the bridge across the waterway.
3. When the bridge is no longer used for transportation purposes, it must be removed in its entirety and you must notify the Coast Guard that the waterway has been cleared.

This advance approval determination will not necessarily apply to future modifications of this bridge or the construction of other bridges along this waterway. Waterway usage may change over time and increased activity along this waterway could remove it from the Advance Approval category. If construction of this bridge is not commenced within 2 years from the date of this letter, please submit an updated "Bridge Project Questionnaire" for reconsideration.

If you have any questions concerning this determination please call me at (305) 415-6740.

JENNIFER N ZERCHER
Bridge Management Specialist
U.S. Coast Guard

Copy: Coast Guard Sector Office Miami, FL via email to Ruth.A.Sadowitz@uscg.mil

City of Fort Lauderdale • Procurement Services Division
100 N. Andrews Avenue, 619 • Fort Lauderdale, Florida 33301
954-828-5933 Fax 954-828-5576
purchase@fortlauderdale.gov

ADDENDUM NO. 2

ITB No. 12201-293
TITLE: Coconut Isle Bridge Replacement (P12089)

ISSUED: 12/5/18

This addendum is being issued to make the following change(s):

1. Added a line item as an Alternate Bid to:
   Furnish all materials, labor, and equipment to remove two existing concrete footing. Each footing is 4 feet thick, and 15 feet by 10 foot long, and the top elevation is 2 foot below the mudline. Removal effort in excesses of this will be considered unforeseen work and will be compensated in accordance with FDOT Standard Specification 4-3 Alteration of Plans or of Character of Work.

All other terms, conditions, and specifications remain unchanged.

Ginah Joseph
Senior Procurement Specialist

Company Name: _____
(please print)

Bidder's Signature: _____

Date: _____

City of Fort Lauderdale • Procurement Services Division
100 N. Andrews Avenue, 619 • Fort Lauderdale, Florida 33301
954-828-5933 Fax 954-828-5576
purchase@fortlauderdale.gov

ADDENDUM NO. 3

ITB No. 12201-293
TITLE: Coconut Isle Bridge Replacement (P12089)

ISSUED: 12/10/18

This addendum is being issued to make the following change(s):

1. Uploaded revised Drawing - Sheet No. S14 – Temporary Support
2. **Extended bid end date to 12/18/2018**

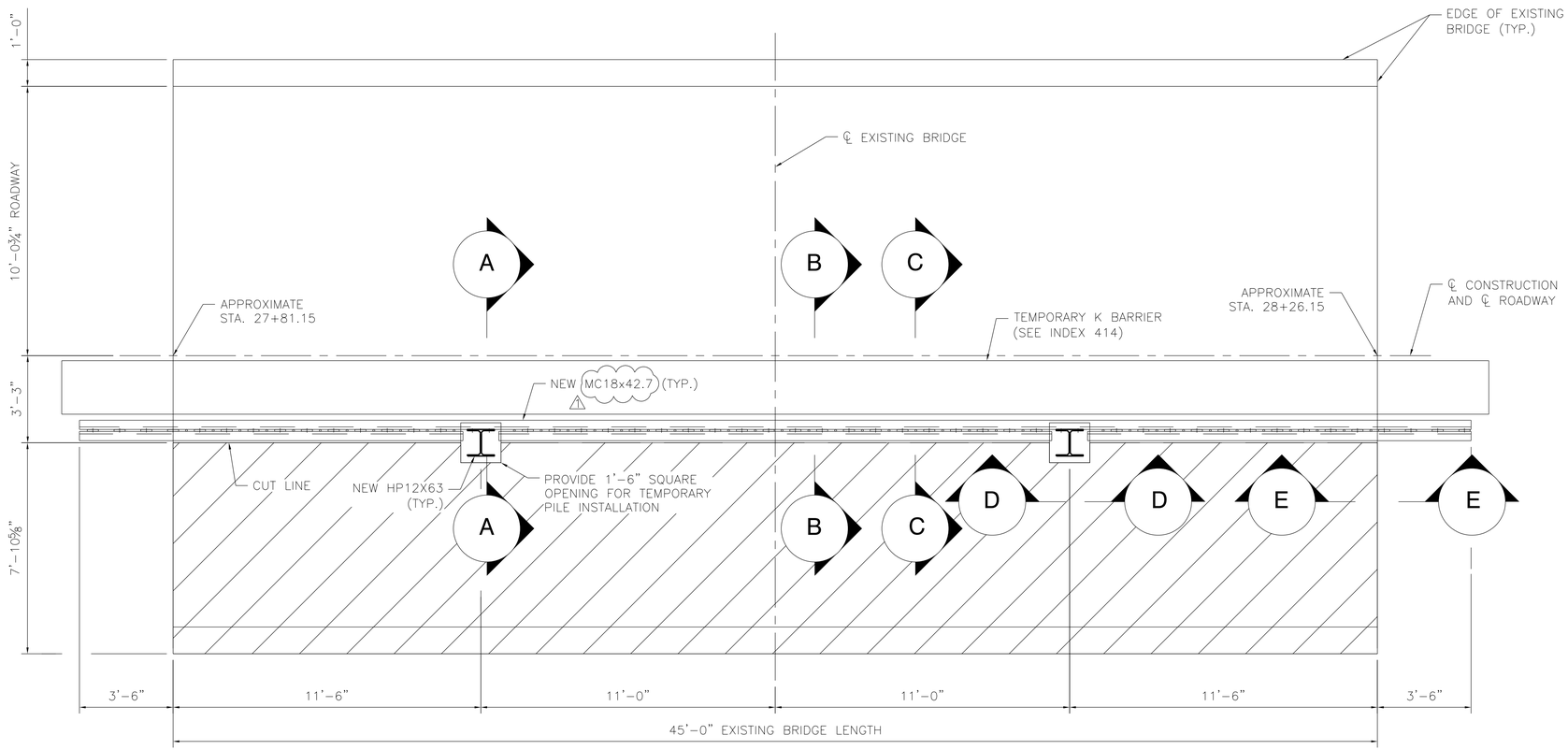
All other terms, conditions, and specifications remain unchanged.

Ginah Joseph
Senior Procurement Specialist

Company Name: _____
(please print)

Bidder's Signature: _____

Date: _____



PLAN OF EXISTING BRIDGE

LEGEND:

REMOVAL LIMITS
(SEE SHEET NO. G09 FOR CONSTRUCTION PHASING)

NOTES

1. DRIVE HP 12X63 TO A MINIMUM NOMINAL BEARING RESISTANCE (NBR) OF 95 TONS. MINIMUM PILE TIPE ELEVATION FOR LATERAL STABILITY SHALL BE (-)30 FT.
2. FOR SECTIONS A-A, B-B, C-C, D-D, & E-E, SEE SHEET NO. S15.

Hardesty &Hanover
1000 SAWGRASS CORPORATE PARKWAY
SUNRISE, FL 33323
(954) 835-9119

ENGINEER:
RONALD SANCHEZ
REG. No: 58923
DATE: 09/25/15
TEL: (954) 835-9119
FAX: (954) 835-9130

DRAWN BY:	DATE:
TB	09/27/18
DESIGNED BY:	SCALE:
RS	
CHECKED BY:	
CG	
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION
1	12/10/2018	RS	RS	Corrected channel size

PROJECT # 12089
COCONUT ISLE
BRIDGE REPLACEMENT
TEMPORARY SUPPORT P&E
COCONUT ISLE DRIVE OVER GRANDE CANAL

SHEET NO. S14 OF 19
TOTAL: 32
CAD FILE: 12089-S14-TEMP
DRAWING FILE NO. 4-139-62

Question and Answers for Bid #12201-293 - Coconut Isle Bridge Replacement P12089

Overall Bid Questions

Question 1

What is the budget for this project? **(Submitted: Nov 6, 2018 5:47:09 PM EST)**

Answer

- Estimated budget is $1,096,655.64 **(Answered: Nov 8, 2018 2:46:50 PM EST)**

Question 2

What is budget / Estimate? **(Submitted: Nov 8, 2018 8:38:57 AM EST)**

Answer

- Estimated budget is $1,096,655.64 **(Answered: Nov 8, 2018 2:46:50 PM EST)**

Question 3

To confirm Required Licenses/Certification. Is a Florida General Contractor with FDOT Minor Bridge classification adequate for bidding on the Cocounut Isle Bridge Replacement Project? **(Submitted: Nov 13, 2018 8:25:00 AM EST)**

Answer

- The required License or Certification shall be the Florida General Contractor License with a minor bridge classification from FDOT or Broward County. **(Answered: Nov 15, 2018 9:58:52 AM EST)**

Question 4

Is the pre-bid meeting mandatory? I have read in the bid documents where it states it is not but in other documents it states it is. I appreciate your clarification on this. **(Submitted: Nov 19, 2018 3:35:37 PM EST)**

Answer

- Attendance is not mandatory.
While attendance is not mandatory, it is strongly suggested that all contractors attend the pre-proposal conference and site visit since tours at other times might not be available. It will be the sole responsibility of the bidder to inspect the City's location and become familiar with the scope of the CityÃƒÂ¢Ã‚Ã€Ã‚Â™s requirements and systems prior to submitting a proposal. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a proposal will be considered evidence that the proposer has familiarized himself with the nature and extent of the work, equipment, materials, and labor required. **(Answered: Nov 19, 2018 3:36:49 PM EST)**

Question 5

Per Prebid Meeting discussion regarding project phasing and temporary bridge support: Please confirm that contractor will be required to submit temporary shoring or temporary bridge plans signed and sealed by a FL registered P.E. and that the selected contractors proposed plan may differ from the phasing/shoring plan provided in the bid documents. **(Submitted: Nov 26, 2018 10:04:20 AM EST)**

Answer

- The contractor is required to submit temporary shoring or temporary bridge plans signed and sealed by a Professional Engineer Licensed to Practice in Florida for any plans THAT DIFFER from the phasing/shoring plans provided in the bid documents. Temporary shoring should be designed in accordance design specifications noted in the General Notes Sheet GO2 from the Construction Drawings. **(Answered: Nov 29, 2018 8:13:15 AM EST)**

Question 6

Per prebid discussion. Please confirm allowable shut down durations to roadway for vehicles and pedestrians during activities that may constitute a risk to the public. (i.e. Installing bridge shoring, pile driving, deliveries, etc.) **(Submitted: Nov 26, 2018 10:11:55 AM EST)**

Answer

- Access to the finger island shall be maintained at all the times, the contractor will be responsible to submit a

MOT plan to the Transportation and Mobility Department for approval. The MOT plan shall indicate the proposed traffic control plan for each phase of the Construction Activity. **(Answered: Nov 29, 2018 8:13:15 AM EST)**

Question 7

Please confirm that if needed, contractor may mobilize and work from and/or stage material using floating equipment in the waterway. Typical floating equipment includes work floats, skiffs, push boat, material and equipment barges up to 30'x90' (dependent on canal width and depth). **(Submitted: Nov 26, 2018 10:16:56 AM EST)**

Answer

- The Bridge Replacement at Coconut Isle Project has been authorized. Stakeholders with concerns in the area include the U.S. Army Corps of Engineers and the United States Coast Guard; letters of approval are available for more information. Although authorization has been granted, there are a few criteria that both the contractor and City shall meet and comply to.

Note that the absence of seagrass in the area and lack of navigation would not preclude the blockage of the canal with a barge for the duration of the project. Also, take into account the geometric restrictions to navigate to the site of the canal and please coordinate these impacts with the homeowners adjacent to the canal. **(Answered: Nov 29, 2018 11:30:35 AM EST)**

Question 8

It was discussed during the prebid meeting that the City and Engineer would consider a steel sheetpile seawall in lieu of the concrete panel wall proposed. It is our opinion that sheet pile would better handle obstructions, eliminate the need for excavation, and reduce vibration when compared to driving concrete panels. Extending the bottom of the concrete seawall cap to mean low water would provide aesthetics similar to the existing adjacent seawalls. Please confirm it is allowable for bidding contractor to provide ssp seawall (including signed and sealed submittal) in lieu of the panel wall in the bid documents. **(Submitted: Nov 27, 2018 8:57:25 AM EST)**

Answer

- We have no objection to the substitution of the concrete piling with steel sheet piling. A new design is required but for bidding purposes, it can be assumed that a steel sheet system of similar stiffness and installation depth would ultimately be acceptable. Note that sacrificial thickness in accordance with FDOT SDG will be required. **(Answered: Nov 30, 2018 8:21:17 AM EST)**

Question 9

The relocation of the FP&L lines as shown on G-10 may not provide OSHA required clear distances while placing piles sheets and deck units **(Submitted: Nov 28, 2018 12:10:20 PM EST)**

Answer

- Our understanding is that the FPL power lines are less than 50kV allowing the use of 10 ft minimum clearance. This should be adequate to perform the work. Please elaborate on specific circumstances where OSHA clearance wonÃ¢Â€Â™t be met. **(Answered: Nov 30, 2018 8:21:17 AM EST)**

Question 10

Page G05 requires signed and sealed shop drawings for water and sewer. Are you expecting an engineer to provide signed and sealed shop drawings and attachments to the bridge deck only to be signed and sealed? **(Submitted: Nov 28, 2018 12:10:41 PM EST)**

Answer

- The requirement is for a licensed engineer to take professional responsibility for the design of the supports which carry the water and sewer pipes and attach to the fascia of the new bridge. It is not necessary that the design be unique to this project. **(Answered: Nov 30, 2018 8:21:17 AM EST)**

Question 11

Page G05 you show conduits and pipes in sidewalk. Who is responsible for these pipes? If we are responsible what is the spec required for each and where will they tie in. I believe that the utilities should be responsible for their own pipe installation and connections. **(Submitted: Nov 28, 2018 12:11:11 PM EST)**

Answer

- Water and Sewer are City of Fort Lauderdale utilities and the Contractor is responsible for installation of these facilities. See project documentation for the specifications.

All other utilities will be installed by responsible utility with the exception that the contractor will need to install

conduit or steel piping per their specification in sidewalk concrete placements. The contractor will coordinate with affected utilities. Contacts are listed in General Notes. **(Answered: Nov 30, 2018 8:21:17 AM EST)**

Question 12

We suggest changing the concrete prestress sheets to one of two things either a steel sheet pile wall with short sheets (3â€™embedment below scour line) and tie the end bent cap to the cap on the sheet pile wall or a concrete precast panel wall same as the steel sheet pile wall. The issue is you will not be able to jet the long prestress sheet pile wall in without affecting the existing bridge. The presetress panels are 27â€™ long +-. This means you would have to jet the panels about 22â€™ which would cause severe undermining of the existing bridge. **(Submitted: Nov 28, 2018 12:12:03 PM EST)**

Answer

- We have no objection to the substitution of the concrete piling with steel sheet piling. A new design is required but for bidding purposes, it can be assumed that a steel sheet system of similar stiffness and installation depth would ultimately be acceptable. Note that sacrificial thickness in accordance with FDOT SDG will be required. **(Answered: Nov 30, 2018 8:21:17 AM EST)**

Question 13

The note number 1 on sheet S02 is not practicable especially when the structure is unknown. These costs should be considered unknown and would be paid as a change order. **(Submitted: Nov 28, 2018 12:12:37 PM EST)**

Answer

- Please see Addendum 2:
Added a line item as an Alternate Bid to:
Furnish all materials, labor, and equipment to remove two existing concrete footing. Each footing is 4 feet thick, and 15 feet by 10 foot long, and the top elevation is 2 foot below the mudline. Removal effort in excesses of this will be considered unforeseen work and will be compensated in accordance with FDOT Standard Specification 4-3 Alteration of Plans or of Character of Work. **(Answered: Dec 5, 2018 11:10:36 AM EST)**

Question 14

Please note the existing seawalls on the north side appear to be old gravity walls. If we build the structure as shown and drive the pile as required, we would rely on the city to repair any damage. The same applies to all structures that would be damaged if we construct the project as shown. **(Submitted: Nov 28, 2018 12:14:09 PM EST)**

Answer

- Technical Specification 108-2.2 Vibration Monitoring limits vibrations to 0.5 inches per second. Maintaining vibration to this amplitude is expected to limit damage to adjacent structures. Damaged induced by in tolerance vibrations would be considered an unforeseen condition. **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 15

We suggest several things in order to minimize the potential for damage. Add additional piling to lower the bearing capacity at each end bent. Minimize the minimum elevation and allow the piles to be jetted to within 1â€™ of the minimum tip and require PDA on all the pile until bearing is achieved. Even look at doing a double row of end bent piles to achieve a lower bearing. Add tie backs and Deadman to caps in order to lessen to the lateral load and raise the tip elevation. Change the piles to auger cast piles, micro piles etc. would even be the best option **(Submitted: Nov 28, 2018 12:15:01 PM EST)**

Answer

- While we are confident that our design can be constructed without damage to adjacent walls, this does not relieve the contractor of taking proper care in developing a Pile Driving Plan which minimizes vibrations. In light of the concerns, we recommend pre-drilling through the upper rock (approximately Elev -20.0) and adhering to the Section 108 vibration monitoring requirements. **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 16

The sheeting shown on page S03 and S16 is a temporary critical sheeting to be made permanent and needs to be designed by the engineer as required by FDOT specs. This design needs to account for the existing footing below to remain on top and not cut thru the footing. Length of wall minimum section and depth needs to be shown **(Submitted: Nov 28, 2018 12:15:49 PM EST)**

Answer

- The Sheet shown on Sheet S-03 and S-16 is a temporary critical wall and will remain in place. However, the sheeting will not have a function beyond temporary fill retention. The sheeting is left in place because removal will not be possible, not, because it is necessary to the final design. Also, the sheeting can be installed after removal of the footing.
The City agrees to provide the design of the temporary sheeting. Until the sheeting design is available, contractorÃ¢Â€Â™s may use the following information for bidding purposes. Sheet pile section is skyline steel NZ14 or similar. Sheet pile length is 30ft. Plan geometry is as shown in the contract documents and is intended to contain flowable fill between new and existing seawalls during construction. Differences from information provided here will be considered unforeseen condition and alternate containment methods may be submitted for consideration. **(Answered: Dec 13, 2018 8:36:07 AM EST)**

Question 17

Consider shorting the bridge to come inside the existing footer. I am not familiar with the hydrology requirements of this opening but in many cases these canal bridges are just flushing channels. **(Submitted: Nov 28, 2018 12:16:34 PM EST)**

Answer

- Shortening the bridge further is not possible due to permitting and hydraulic concerns. **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 18

Sheet S09 note number 2,3&4, I am not sure where this expansion joint is shown on the plans. Please provide a manufacture of an 8ÃƒÂ¢Ã‚Â€Ã‚Â wide by 5ÃƒÂ¢Ã‚Â€Ã‚Â thick crack arrest strip material. 5ÃƒÂ¢Ã‚Â€Ã‚Â thick material on top of keyway would only allow for 1ÃƒÂ¢Ã‚Â€Ã‚Â of concrete over the top of the expansion material is the deck was poured 6ÃƒÂ¢Ã‚Â€Ã‚Â thick. **(Submitted: Nov 28, 2018 12:16:58 PM EST)**

Answer

- The symbol which the questioner has interpreted as 5" is shown in note 3 on sheet S09 due to printing error. The correct maximum thickness dimension is 1/8". **(Answered: Dec 4, 2018 3:39:18 PM EST)**

Question 19

Not sure I understand the meaning of note 11 on page G02. What is considered ÃƒÂ¢Ã‚Â€Ã‚œapproach spanÃƒÂ¢Ã‚Â€Ã‚Â . **(Submitted: Nov 28, 2018 12:17:30 PM EST)**

Answer

- The term "Approach Span" should be replaced with "Prestressed Slab Span". **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 20

You have allowances in bid for utility relocation. We do not think these allowances are enough to cover the cost. We are assuming that all cost and coordination of the utilities is the responsibility of the city. **(Submitted: Nov 28, 2018 12:17:58 PM EST)**

Answer

- The utility relocation allowances are for furnish and install of City water and sewer utilities and for coordination with remainder of utilities. **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 21

Note 7B requires the concrete sheet piles to have silica fume. Are you requiring the 18â€ concrete piles to have silica fume?. I understand that the piles are upland and not directly in contact with the water but just am double checking. **(Submitted: Nov 28, 2018 12:18:27 PM EST)**

Answer

- We are not requiring the 18Ã¢Â€Â concrete piles to contain silica fume. **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 22

Is the city requiring the contractor to sign and seal the temporary support system shown on S14 and S15? **(Submitted: Nov 28, 2018 12:19:15 PM EST)**

Answer

- The contractor is required to submit temporary shoring or temporary bridge plans signed and sealed by a FL registered P.E. for any plans THAT DIFFER from the phasing/shoring plans provided in the bid documents. Temporary shoring should be designed in accordance design specifications noted in the General Notes. The

temporary support system as presented in the plans may be used without submission of additional signed and sealed plans. **(Answered: Dec 4, 2018 3:31:31 PM EST)**

Question 23

Looking at the borings we believe that the bridge could be supported on a spread footing behind the existing end bents with at most minimal soil enhancements. This would eliminate the need for driving piles and long sheet piles. This item needs to thoroughly investigated as any type of pile driving will produce vibrations enough to damage structures in the immediate area. We have used spread footers on other bridges with great success. **(Submitted: Nov 28, 2018 12:19:58 PM EST)**

Answer

- It is likely that spread footings could support the load of a new structure. Presumably the spread footings would be placed far enough behind the existing seawalls to avoid additional surcharge on the existing seawalls. This would require longer spans that would require raising the profile and would also extend the project limits and resulting impacts to adjacent properties. Also, organic soils were encountered to El. -7.0, so, demucking and dewatering would be required to support the structure on a footing. Our opinion is that spread footings would eliminate the risk of vibratory damage to existing seawalls at the cost of extending the project impacts to adjacent properties, negatively impacting roadway sightlines, increasing the cost of the project, and would still potentially damage the existing seawalls due to surcharge loads or the manipulation necessary to remove the existing seawall **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 24

To follow up on working from water. Please confirm USL&H insurance is sufficient for working next to and on the water and Jones act coverage is not applicable to this project. **(Submitted: Dec 3, 2018 11:20:58 AM EST)**

Answer

- The City of Fort Lauderdale will be able to accept USL & H insurance in lieu of Jones Act. **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 25

Considering the unanswered questions that may require addenda and followup questions. Could the City extend the question deadline and push out the bid date to adequately receive and follow up(if necessary) to the upcoming responses? **(Submitted: Dec 3, 2018 11:22:34 AM EST)**

Answer

- Please refer to Addendum NO. 3:
Extended bid end date to 12/18/2018
All other terms, conditions, and specifications remain unchanged. **(Answered: Dec 10, 2018 4:05:52 PM EST)**

Question 26

Is the contractor allowed to remove the Gumbo Limbo tree located on the NW corner of the bridge? Do we need to obtain a tree removal permit from a specific agency? **(Submitted: Dec 3, 2018 4:28:36 PM EST)**

Answer

- If the contractor is allowed to remove the Gumbo Limbo tree during construction, a tree removal permit is required along with the equivalent replacement. **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 27

Is the city responsible to relocate the pole and electrical service for the property located on the NE corner of the bridge? This pole will be in the way of the heavy equipment needed to perform the work. **(Submitted: Dec 3, 2018 4:31:49 PM EST)**

Answer

- The plans include phasing of the FPL service but not relocation of the existing pole. Preliminary utility coordination with FPL indicated that FPL would relocate the lines on request. Note that scheduling of relocation and accounting for resulting scheduling impacts is the ContractorÃ¢Â€Â™s responsibility. **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 28

The East and West properties at the North end of the bridge will be affected by losing parking spaces (East property) and blocked entrance (West property). Has the city talked to the owners of these properties about how the construction will affect them? **(Submitted: Dec 3, 2018 4:35:29 PM EST)**

Answer

- The City held public involvement meetings with the community and invited all affected parties. Specific meetings with adjacent owners were not held. Note that all planned work is within existing City right of way. **(Answered: Dec 5, 2018 2:40:39 PM EST)**

Question 29

1. Sheet S-14 calls out a new MC12x50 channel but is not shown in any of the cross sections on s-15. Please verify if this is a typo or if there is a detail missing.
2. S-15 cross sections B-B & C-C show a new MC10x41.1 but section D-D shows a new MC18x42.7 channel. Please verify which is correct? **(Submitted: Dec 7, 2018 3:03:15 PM EST)**

Answer

- 1. The NEW MC 12x50 shown on page S14 is a typo, the Miscellaneous Channel Structural Size use on the bridge is MC 18 x 42.7. Therefore, we are going to work on an additional addendum to submit the correct information.
2. All of the cross sections on page S-15 show the Miscellaneous Channel Structural Size MC 18 X 42.7. **(Answered: Dec 7, 2018 3:12:38 PM EST)**
- Please refer to Addendum NO. 3:
Uploaded revised Drawing - Sheet No. S14 Ã¢Â€Â“ Temporary Support
All other terms, conditions, and specifications remain unchanged. **(Answered: Dec 10, 2018 4:05:52 PM EST)**

Question 30

I am trying to find specifics on mechanical couplers for the Coconut Isle Bridge Replacement project. The spec is asking us to refer to the City's Approved Product List. (APL). Can you please guide me in how to access that list? **(Submitted: Dec 13, 2018 2:47:47 PM EST)**

Answer

- Use mechanical couplers or splice devices with develop at least 125% of the specified yield strength of the bar being spliced or refer to the FDOTÃ¢Â€Â™s approved product list. Please see the link below for references: https://fdotws1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/118 **(Answered: Dec 13, 2018 2:51:34 PM EST)**